122—40

TRANSCRIPT OF RECORD.

SUPREME COURT OF THE UNITED STATES

OCTOBER TERM, 1886.

No. 120.

HARRIS EAMES, APPELLANT,

vs.

WILLIAM D. ANDREWS, GEORGE H. ANDREWS, AND NELSON W. GREEN.

APPEAL FROM THE CIRCUIT COURT OF THE UNITED STATES FOR THE DISTRICT OF CONNECTICUT.

FILED OCTOBER 9, 1883.

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1886.

No. 120.

HARRIS EAMES, Appellant,

vs.

WILLIAM D. ANDREWS & OTHERS.

Appeal from the circuit court of the United States for the district of Connecticut.

It is stipulated hereby that the record in the above-entitled cause be amended by adding thereto a copy of the complainant's exhibit of reissued letters patent granted Nelson W. Green, May 9th, 1871, No. 4372, and marked "Green Reissue;" also copy of assignment of same and power of attorney, being complainant's exhibit marked "Assignment and power of attorney" (see page 30, folio 60, of said record), and the clerk of said court is requested to print the same as part of the record in said cause.

Dated October 13th, 1886.

C. R. INGERSOLL,
Solicitor for Appellant, & of Counsel.
J. C. CLAYTON,
Solicitor for Appellee, and of Counsel.

[Endorsed:] Supreme Court U. S. Oct. T., 1886. No. 120. Harris Eames, appellant, *vs.* W. D. Andrews *et al.* Stipulation of counsel amending record by making ceratin exhibits part thereof.

[Endorsed:] Supreme Court U. S, 1886, Oct'r term. No. 120. Harris Eames, app't, *vs.* Wm. D. Andrews *et al.* Stipulation making original exhibits part of record. [Stamped:] Office Supreme Court U. S. Filed Oct. 15, 1886. James H. McKenney, clerk.

Green reissue. E. E. Marvin, Ex'm'r.

(65.)

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the records of this office of the reissue letters patent granted Nelson W. Green, May 9th, 1871, No. 4372, for imp't in the methods of constructing artesian wells.

In testimony whereof I, W. H. Doolittle, Acting Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed this twenty-fourth day of February, in the year of our Lord one thousand eight hundred and seventy-nine, and of the Independence of the United States the one hundred and third.

[Seal Patent Office United States of America.]

W. H. DOOLITTLE,
Acting Commissioner.

No. 4372. Reissue.

UNITED STATES OF AMERICA:

To all to whom these letters patents shall come:

Whereas Nelson W. Green, of Amherst, Massachusetts, has alleged that he has invented a new and useful improvement in the methods of constructing artesian wells (for which letters patent were issued to him, dated January 14, 1868, which letters having been surrendered the same have been canceled and new letters ordered to issue to him on an amended specification), and has made oath that he is a citizen of the United States, that he verily believes he is the original and first inventor or discoverer of the said improvement, and that the same hath not to his knowledge and belief been previously known or used; has paid into the Treasury of the United States the sum of thirty dollars and presented a petition to the Com-Commissioner of Patents praying that a patent may be issued therefor:

These are therefore to grant to the said Nelson W. Green, his executors, administrators, or assigns, for the term of seventeen years from the fourteenth day of January, one thousand eight hundred and sixty-eight, the full and exclusive right and liberty of making, using, and vending to others to be used, the said improvement, a description whereof is given in the annexed schedule and made a part of these presents.

In testimony whereof I have caused these letters to be made patent and the seal of the Patent Office to be hereunto affixed.

Given under my hand at the city of Washington this ninth day of May, in the year of our Lord one thousand eight hundred and seventy-one, and of the Independence of the United States of America the ninety-fifth.

C. DELANO,
Secretary of the Interior.

Countersigned and sealed with the seal of the Patent Office.
[SEAL.]

M. D. LEGGETT,
Commissioner of Patents.

[Endorsed:] I certify that this exhibit was used in the trial in the circuit court. Attest: E. E. Marvin, cl'k U. S. circuit court, dist. of Connecticut.

4372.

UNITED STATES PATENT OFFICE.

NELSON W. GREEN, of Amherst, Massachusetts.

Improvement in the Methods of Constructing Artesian Wells.

Specification forming part of Letters Patent No. 73425, dated January 14, 1868; reissue No. 4372, dated May 9, 1871.

To all whom it may concern:

Be it known that I, Nelson W. Green, of Amherst, in the county of Hampshire and State of Massachusetts, have invented a new and improved method of constructing artesian wells; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing forming part of this specification.

My invention is particularly intended for the construction of artesian wells in places where no rock is to be penetrated.

The methods of constructing wells previous to this invention were what have been known as "sinking" and "boring," in both of which the hole or opening constituting the well was produced by taking away a portion of the earth or rock through which it was made.

This invention consists in producing the well by driving or forcing down an instrument into the ground until it reaches the water, the hole or opening being thus made by a mere displacement of the earth, which is packed around the instrument, and not removed upward from the hole as it is in boring. The instrument to be employed in producing such a well, which, to distinguish it from "sunk" or "bored" wells, may be termed a "driven well," may be any that is capable of sustaining the blows or pressure necessary to drive it into the earth; but I prefer to employ a pointed rod, which, after having been driven or forced down until it reaches the water, I withdraw, and replace by a tube made air-tight throughout its length, except at or near its lower end, where I make openings or perforations for the admission of water, and through and from which the water may be drawn by any well-known or suitable form of pump.

In certain soils the use of a rod preparatory to the insertion of a tube is unnecessary, as the tube itself through which the water is to be drawn may be the instrument which produces the well by the act of driving it into the ground to the requisite depth.

To enable others to make and use my invention, I will proceed to describe it with reference to the drawing, in which—

Figure 1 represents a portion of the pointed rod above mentioned, and Fig. 2 a portion of the tube which forms the casing or lining of the well.

The driving-rod A I construct of wood or iron or other metal, or of parts of each, with a sharp point, *b*, of steel or otherwise, to penetrate the earth, and a slight swell, *a*, a short distance above the point, to make the hole slightly larger than the general diameter of the rod. This rod I drive, by a falling weight or other power, into the earth until its point passes sufficiently far into the water to pro-

cure the desired supply. I then withdraw the rod and insert in its place the air-tight iron or wooden tube B, which may be slightly contracted at its lower end to insure its easy passage to its place. In general this tube B I make of iron, and of a thickness that will bear a force applied at its upper extremity sufficient to drive or force it to its place; and where a large or continuous flow of water is desired, I perforate this tube near its lower end to admit the water more freely to the inside.

The perforations *c* may be about one-half of an inch in diameter, less or more, and from one to one and a half inches apart, and the perforations may extend from the bottom of the tube upward from one to two feet.

The diameter of the tube should be somewhat smaller than the diameter of the swell *a* on the drill end of the driving-rod A.

In localities where the water is near the surface of the ground, and the well is for temporary use only, as in the case of a moving army or for temporary camps, lighter and thinner materials than iron may be used for making the tubes, as, for instance, zinc, tin, copper, or sheet metal of other kind, or even wood may be used.

The rod may be of any suitable and practical size that can be readily driven or forced into the ground, and may be from one to three inches in diameter.

In some cases the water will flow out from the top of the tube without the aid of a pump. In other cases the aid of a pump to draw the water from the well may be necessary. In the latter cases I attach to the tube, by an air-tight connection, any known form of pump.

What I claim as my invention, and desire to secure by letters patent, is—

The process of constructing wells by driving or forcing an instrument into the ground until it is projected into the water without removing the earth upward as it is in boring, substantially as herein described.

N. W. GREEN.

Witnesses:
SIDNEY E. SMITH.
W. MORRIS SMITH.

[Endorsed:] Reissue patent 4372. Certified copy. Filed July 14, 1882. E. E. Marvin, cl'k.

(65.)

Assignment & Power of Attorney. E. E. Marvin, Exmr.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the records of this office.

In testimony whereof I, Ellis Spear, Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed this eigh-

Re-issue

N. W. Green's

Imp^d Method of Constructing Artesian Wells.

4372

REISSUED MAY 9 1871

Fig. 1

Fig. 2

N. W. Green

Witnesses
Fred Haynes
Alexander Barnes

teenth day of July, in the year of our Lord one thousand eight hundred and seventy-seven, and of the Independence of the United States the one hundred and second.

[Seal Patent Office, United States of America.]

ELLIS SPEAR,
Commissioner.

J 14, p. 267.

Power of Attorney.

Know all men by these presents that I, Nelson W. Green, of the town of Amherst, county of Hampshire, and State of Massachusetts, have made, constituted and appointed, and by these presents do make, constitute, and appoint, William D. Andrews and Brother my true and lawful attorneys for me, and in my name, place, and stead, solely to manage, sell, and convey all rights, titles, and interest I now own or possess in and to one undivided half share of letters patent of the United States of America granted to me under date of January 14th, A. D. 1868, and numbered 73425, which said letters patent were reissued with amended claims, bearing date May 9th, 1871, and numbered 4372, and to collect all sums or amounts due me or to become due to me under and by virtue of the said letters patent, and to bring and conduct any suit or suits, action or actions, that may become necessary in the prosecution of the business of selling rights and collecting royalties under and by virtue of the said letters patent; to sign deeds for rights, satisfaction pieces in suits, and any and all papers necessary in the transaction of the said business; binding myself to grant to no other party or parties any power or right of any kind whatsoever to bargain, sell, convey, or in anywise interfere with the power herein conveyed so long as this my power of attorney shall remain unrevoked.

And I further empower my said attorneys to collect and sue for all sums or amounts due me for infringment of my said letters patent, divesting myself, as well as every and all other persons, of any power to control or interfere with my said attorneys so long as this my power of attorney remains unrevoked, giving and granting unto my said attorneys full power and authority to do and perform all and every act and thing whatsoever requisite and necessary to be done in and about the premises as fully to all intents and purposes as I might or could do if personally present, with full power of substitution and revocation, hereby ratifying and confirming all that my said attorneys or their substitute shall lawfully do or cause to be done by virtue thereof.

[Fifty-cent stamp. Canceled.]

In witness whereof I have hereunto set my hand and seal the third day of July, in the year one thousand eight hundred and seventy-one.

N. W. GREEN. [L. S.]

Sealed and delivered in the presence of—
THEODORE M. TUTHILL.

STATE OF NEW YORK, }
County of New York, } ss:

Be it known that on the third day of July, in the year one thousand eight hundred and seventy-one, before me came Nelson W. Green, to me known to be the individual described and who executed the above letter of attorney, and acknowledged the above letter of attorney to be his act and deed.

In testimony whereof I have hereunto subscribed my name the day and year last above written.

[Notarial seal.]

THEODORE M. TUTHILL,
Notary Public, N. Y. City.

Recorded July 5, 1871.

Assignment.

J. 14, p. 269.

Whereas Nelson W. Green, of the town of Amherst, county of Hampshire, and State of Massachusetts, formerly of the town of Cortland, county of Cortland, and State of New York, did obtain letters patent of the United States of America for certain improvements in the process of driving wells, which letters patent bear date the fourteenth day of January, eighteen hundred and sixty-eight, and are numbered 73425, which said letters patent were reissued with amended claims, bearing date the ninth of May, eighteen hundred and seventy-one, and numbered 4372;

And whereas William D. Andrews and George H. Andrews, comprising and composing the firm of William D. Andrews & Brother, doing business in the city of New York, are desirous of acquiring an interest therein:

Now, this indenture witnesseth that, for and in consideration of the sum of one dollar to him, the said Nelson W. Green, in hand paid, the receipt of which is hereby acknowledged, I have assigned, sold, and set over, and do hereby assign, sell, and set over, unto the said William D. Andrews & Brother the undivided one-half of all the right, title, and interest which I have in and to the said invention as secured to me by said letters patent, excepting only my rights, title, and interest in and to the following enumerated territory, which has been by me heretofore sold and disposed of, to wit: The States of Ohio, Texas, New Jersey, Delaware, Oregon, Minnesota, and one-half the District of Columbia.

The counties of Norfolk, Dukes, Hampshire, Hampden, and one-half the county of Berkshire, in the State of Massachusetts.

The county of Hillsborough, in the State of New Hampshire.

The counties of New York, Kings, Queens, Suffolk, Livingston, Steuben, Ontario, Chenango, Washington, Fulton, Columbia, Wyoming, Cayuga, and Dutchess, in the State of New York.

The counties of Carbon, Monroe, Bradford, Wyoming, Potter, Erie, and Crawford in the State of Pennsylvania.

The counties of *Gadsden* and Davidson in the State of Tennessee.

The county of Kenton, in the State of Kentucky.

The county of Rockbridge, in the State of West Virginia.

The county of Pulaski, in the State of Arkansas.

The county of Washington, in the State of Maryland.

The counties of Warwick, Elizabeth City, Matthews, Nansemond, Norfolk, and Princess Anne, in the State of Virginia.

The county of Wake, in the State of North Carolina.

The county of Abbeville, in the State of South Carolina.

The counties of Fulton, Decatur, Thomas, Lowndes, and Brooks, in the State of Georgia.

The counties of Jefferson, Madison, and Duval, in the State of Florida.

The counties of Talladega, Dallas, and Mobile, in the State of Alabama.

The county of East Baton Rouge, in the State of Louisiana.

The county of Madison, in the State of Mississippi.

The county of San Francisco, in the State of California.

The counties of Hendricks, Wayne, Morgan, Greene, Elkhart, and Knox, in the State of Indiana.

The counties of De Witt, Grundy, and Kane, in the State of Illinois.

The counties of Jackson, Ottawa, and Kalamazoo, in the State of Michigan.

The counties of Polk, Dallas, Iowa, Tama, Woodbury, Monona, Des Moines, and Cedar, in the State of Iowa.

The counties of Rock, Green, Dane, and Walworth, in the State of Wisconsin.

The county of Burt, in the State of Nebraska.

The counties of Pottawatomie and Shawnee, in the State of Kansas.

The counties of Barry, Dunklin, Wayne, Taney, Ripley, Stoddard, Ozark, Oregon, Newton, New Madrid, Wayne, and Scott, in the State of Missouri.

The towns of Raynham, Taunton, and Berkley, in the county of Bristol and State of Massachusetts.

The towns of Waltham and Malden, in the county of Middlesex and State of Massachusetts.

The town of Big Flats, in the county of Chemung and State of New York.

The towns of Wilkesbarre and Kingston, in the county of Luzerne and State of Pennsylvania.

The towns of Harrisburg and Middleton, in the county of Dauphin and State of Pennsylvania.

The towns of Wayne and Decatur, in the county of Marion and State of Indiana.

The towns of Jackson, White River, Washington, Clay, and Delaware, in the county of Hamilton and State of Indiana.

The town of Tekonsha, in the county of Calhoun and State of Michigan.

The towns of Wheatfield and Williamston, in the county of Ingham and State of Michigan.

The same to be held and enjoyed by the said William D. Andrews

& Brother, for their own use and behoof, and for the use and behoof of their legal representatives, to the full end of the term for which said letters patent are granted as fully and entirely as the same would have been held and enjoyed by me if this assighment and sale had not been made.

In testimony whereof I hereunto set my hand and affix my seal this third day of July, A. D. 1871.

5 July 3, 5 N. W. G. 1871.

Folio 2, line 2, the words "the undivided" interlined before the signing of same.

N. W. GREEN. [L. S.]

Sealed and delivered in the presence of—

——— ———.

STATE OF NEW YORK, *City and County of New York:*

On this third day of July, A. D. 1871, before me personally came Nelson W. Green, to me known to be the individual described in and who executed the within agreement, and acknowledged to me that he executed the same.

[Notarial seal.]

THE. M. TUTHILL,
Notary Public, N. Y. City.

5 July 3, 5 N. W. G. 1871.

Recorded July 5, 1871.

Filed July 14, 1882.

E. E. MARVIN, *Clerk.*

I certify that this exhibit [was] used in evidence in the trial in the circuit court.

Attest:

E. E. MARVIN,
Clerk U. S. Circuit C't, District of Conn.

SUPREME COURT OF THE UNITED STATES

OCTOBER TERM, 1886.

No. 120.

HARRIS EAMES, APPELLANT,

vs.

WILLIAM D. ANDREWS, GEORGE H. ANDREWS, AND NELSON W. GREEN.

APPEAL FROM THE CIRCUIT COURT OF THE UNITED STATES FOR THE DISTRICT OF CONNECTICUT.

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JUDD & DETWEILER, PRINTERS, WASHINGTON.

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1, 2, & 3 United States Circuit Court, District of Connecticut. In Equity.

WILLIAM D. ANDREWS, GEORGE H. ANDREWS, and NELSON W. GREEN, Complainants,

v.

HARRIS EAMES, Defendant.

To the honorable the Supreme Court of the United States:

The appeal of Harris Eames, the above-named defendant and appellant, respectfully showeth:

That on the 6th day of June, 1879, William D. Andrews, George H. Andrews, and Nelson W. Green, the above-named complainants, filed their bill in the circuit court of the United States for the district of Connecticut against the above-named defandant, therein alleging that on the 14th day of January, 1868, letters patent of the United States were duly issued to Nelson W. Green, of Courtland, in the State of New York, for an improvement in the manner of constructing and sinking artesian or driven wells, and securing to said Green and his representatives the exclusive right to said im-
4 provement for the term of seventeen years from the date thereof, said letters patent being numbered 73425; that said letters patent were subsequently surrendered, and on the 9th day of May, 1871, new letters patent for the same invention were obtained, bearing date the day and year last aforesaid, and numbered reissue No. 4372; that the said complainants are the owners of said letters patent by mesne assignment from said Green; that the said improvement is of great value, and has been ever since said assignment possessed and put in practice by the complainants, and that by certain proceedings had by said complainants in the circuit courts of the United States said letters patent had been sustained and upheld, and that notwithstanding the premises the said defendant had made and constructed wells using and employing said invention in the county of New Haven, in the State of Connecticut, in infringement of said letters patent and contrary to the rights of said complainant, and praying for a decree of injunction and account, as by said bill will more fully appear.

And the said defendant, on the 16th day of September, 1879, filed its answer to said bill of complainant, admitting the issue of said letters patent to said Green and the reissue thereof, but deny-
5 ing that said reissue was for the same invention or was made for lawful cause, or that it was valid in law, and also denying that the said Green was the original and first inventor of the improvement in said letters patent to him described, and also denying infringement.

That the said complainants filed their replication to this answer, and the cause being at issue the parties proceeded to take testimony in support of their respective allegations, and at the April term of said circuit court, A. D. 1882, held at New Haven, in the district of Connecticut, were fully heard by their counsel thereon.

That at a stated term of said circuit court held at New Haven on

the fourth Tuesday of April, 1883, a final decree was made and pronounced in the cause, wherein it was adjudged and decreed that the letters patent referred to in said complainants' bill as issued to Nelson W. Green and thereafter reissued, said reissue bearing date May 9th, 1871, were good and valid in law, and that the said Green was the first and original inventor of the improvement therein described, and that the defendant had infringed the same, and that the complainants recover of the profits and damages by reason of said infringement in the sum of twenty dollars and the further sum of —— as costs of suit.

6 Wherefore this appellant appeals from the whole of said decree of said circuit court of the United States, and respectfully prays that the decree of the said circuit court and bill, answer, pleadings, depositions, evidence, and proceedings in said cause may be sent to the Supreme Court of the United States without delay, and that the said Supreme Court will proceed to hear the said cause anew, and that the said decree of the circuit court and every part thereof may be reviewed, and a decree made reversing said decree, with costs, or such other decree as to the said Supreme Court may seem just.

Dated at New Haven this 9th day of August, 1883.

C. R. INGERSOLL,
Defendant's Solicitor & of Counsel.

7 Supreme Court of the United States. In Equity.

WILLIAM D. ANDREWS, GEORGE H. ANDREWS, NELSON W. GREEN
v.
HARRIS EAMES.

Know all men by these presents that we, Harris Eames, of Orange, in New Haven county, State of Connecticut, as principal, and James Graham, of New Haven, in said county, as surety, are held and firmly bound unto William D. Andrews, George H. Andrews, and Nelson W. Green, the above-named complainants, in the sum of five hundred dollars, to be paid to the said William D. Andrews, George H. Andrews, and Nelson W. Green, and their executors, administrators, and assigns; to which payment, well and truly to be made, we bind ourselves and each of us, jointly and severally, and our and each of our heirs, executors, administrators, and assigns, firmly by these presents.

Dated this 10th day of August, 1883.

Whereas the above-named Harris Eames has taken an appeal to the Supreme Court of the United States to reverse the decree rendered in the above-entitled action by the circuit court of the United States for the district of Connecticut:

8 Now, therefore, the condition of this obligation is such that if the above-named Harris Eames shall prosecute his said appeal to effect and answer all costs if he shall fail to make good his

plea, then this obligation shall be void; otherwise to remain in full force and virtue.

HARRIS EAMES. [SEAL.]
JAMES GRAHAM. [SEAL.]

Approved Aug. 16, 1883.

N. SHIPMAN,
District Judge.

9 By the Honorable Nathaniel Shipman, one of the judges of the circuit court of the United States for the district of Connecticut, to William D. Andrews, George H. Andrews, Nelson W. Green:

Whereas Harris Eames has lately appealed to the Supreme Court of the United States from a decree lately rendered in the circuit court of the United States for the district of Connecticut, made in favor of you, the said William D. Andrews, George H. Andrews, and Nelson W. Green, and has filed the security required by law, you are therefore hereby cited to appear before the said Supreme Court, at the city of Washington, on the second Monday of October next, to wit, October, 1883, to do & receive what may appertain to justice to be done in the premises.

Given under my hand at the city of Hartford, in the district of Connecticut, the 16th day of August, A. D. 1883.

N. SHIPMAN, *Judge.*

9½ HARTFORD, *Aug. 16th*, 1883.

Due & timely service of the foregoing appeal is hereby acknowledged.

WM. D. ANDREWS,
GEORGE H. ANDREWS,
NELSON W. GREEN,
By HYDE & JOSLYN,
Their Solicitors and Attorneys.

[Endorsed:] Wm. D. Andrews *et al. v.* Harris Eames. Citation. Filed August 9, 1883.

10 In the Circuit Court of the United States for the District of Connecticut. In Equity.

To the honorable the judges of the circuit court of the United States for the judicial circuit within and for the district of Connecticut:

William D. Andrews and Brother (said firm consisting of William D. Andrews and George H. Andrews), doing business in the city of New York, in the State of New York, and Nelson W. Green, doing business in Springfield, in the State of Massachusetts, bring this their bill of complaint against Harris Eames, of the town of Orange, in the county of New Haven, and a citizen of the State and district of Connecticut, and thereupon your orators complain and say, the said William D. Andrews and George H. Andrews, on information and belief:

That said Green was the original and first inventor of a new and useful improvement in wells, fully described in the letters patent hereinafter mentioned, and which had not been known or used before his said invention, and which, at the time of his application for a patent, as hereinafter mentioned, had not been for more than two years in public use or on sale with his consent or allowance.

And your orators, on information and belief, further show unto your honors that said Green, being so as aforesaid the first inventor and discoverer of said improvement, and being also a citizen of the United States, did, on the 14th day of January, 1868, upon due application therefor, obtain letters patent of the United States for said invention, in due form of law, under the seal of the Patent Office of the United States, signed by the Secretary of the Interior and countersigned by the Commissioner of Patents of the United States, bearing date the day and year last aforesaid, whereby there was granted and secured to said Green, his heirs, administrators, or assigns, or intended so to be, for the term of seventeen years from and after the date of said letters patent, the full and exclusive right and liberty of making, constructing, using, and vending to others to be used the said invention and improvement as set forth in said letters patent, which are now remaining on record in the Patent Office of the United States, and by virtue whereof said Green became and was the sole owner of all the rights and privileges granted and secured, or intended to be granted and secured, in and by said letters patent.

And your orators further show unto your honors that said Green having for good and lawful cause surrendered said letters patent to the Commissioner of Patents, and having made due application therefor, and having in all things complied with the acts of Congress in such case made and provided, did, on the 9th day of May, 1871, obtain new letters patent, being for the same invention, for the residue of said term, and which were marked "Reissue No. 4372," and were issued in due form of law, under the seal of the Patent Office of the United States, signed by the Secretary of the Interior, and countersigned by the Commissioner of Patents, and bearing date the day and year last aforesaid, as by the said last-mentioned letters patent, or a duly authenticated copy thereof, ready in court to be produced, will more fully and at large appear. And your orators have ratified and adopted said reissue.

11 And your orators further show unto your honors that by virtue of a certain mesne assignment duly executed the said Green did, on the 3d day of July, 1871, assign and transfer to your orators, William D. Andrews and George H. Andrews, the undivided one-half of all his the said Green's right, title, and interest in and to the said invention as secured to him by said letters patent, including certain rights which he had theretofore excepted and reserved to himself from sundry mesne assignments by him to others before made, which said instrument was duly recorded in the Patent Office of the United States, as by said instrument, or a duly authenticated copy thereof, and of the certificate of said recording thereto affixed, ready in court to be produced, will fully and at large appear.

And your orators further show unto your honors that by virtue of a mesne assignment duly executed the said William D. Andrews and Brother (William D. Andrews and George H. Andrews, composing the said firm) and the said Green did assign and transfer to your orator the undivided — of their right, title, and interest in and to the said invention as secured by said letters patent, including all royalties and damages which have previously accrued and remain unpaid in and for the —, reserving to themselves the exclusive right to dispose of the same to the United States for military, naval, and cemetery purposes; which said instrument was duly recorded in the Patent Office of the United States, as by said instrument, or a duly authenticated copy thereof, and of the certificate of said recording thereto affixed, ready in court to be produced, will fully and at large appear.

And your orators further show unto your honors that by virtue of the said letters patent issued to said Green as aforesaid, and of the mesne assignments as hereinbefore recited, and by virtue of other various mesne assignments by, to, and from the said Green and others, duly made, executed, and recorded in the Patent Office of the United States, as by such instruments or duly authenticated copies thereof and of the certificate of such recording thereto affixed, ready in court to be produced, will duly and at large appear, your orators did, by virtue of the premises, become, and now are, the sole and exclusive owners of said letters patent and invention and of all the rights and privileges granted and secured, or intended to be granted and secured, thereby in and for the said town of Orange, in said district of Connecticut; and that since they became the owners thereof as aforesaid they have invested and expended large sums of money, and have been to great trouble in and about said invention, and for the purpose of carrying on the business of constructing said wells and using the same and making the same profitable to themselves and useful to the public, and that said invention has been and is of great benefit and advantage, and that wells were constructed and made according to said invention, and sold by said your orators to great advantage to the public, and that the public have generally acknowledged and acquiesced in the aforesaid rights of your orators, and your orators believe that they will realize and receive large gains and profits therefrom if infringements by said defendant and his confederates shall be prevented.

And your orators further show unto your honors that your orators, in connection with Orlando Bennet and Platt Conklin, being the owners of said reissue letters patent for the county of Queens, in the State of New York, did, in the month of April, 1872, file a bill in the circuit court of the United States for the eastern district of New York against Theodore A. Carman for infringement of said reissue letters patent, and praying for an injunction and an account; that said Carman appeared in said suit and filed an answer denying infringement, and setting up that your orator, Green, was not the first and original inventor of the invention patented by said reissue letters patent, and alleging that before the invention thereof by said Green the same had been known to and used by many persons in

different parts of the United States, and had been described in patents and in many printed publications; that said Green had forfeited his right to a patent by said invention having been in public use and on sale for more than two years before his application for letters patent therefor; that said Green had abandoned his invention and dedicated it to the public, and that said reissue letters patent were for an invention different from that described in said original letters patent, and were therefore null and void.

That your orators filed a replication to said answer, and a very large amount of testimony was taken on both sides, the record on the part of your orators amounting to more than fourteen
12 hundred printed pages, and that on the part of the defendant amounting to more than twelve hundred printed pages, the taking of said testimony having been commenced in June, 1872, and concluded in November, 1873.

That said testimony was taken at many different places, among them, at Detroit, Mich.; Chicago, Ill.; Amherst, Mass.; Middletown, Ct., and at many cities and villages in the central and western parts of the State of New York, as well as in the city of New York, and witnesses were brought from several adjoining States and the District of Columbia, and that the evidence comprises the testimony of about one hundred and seventy witnesses.

That said suit was brought to a hearing on pleadings and proofs, and was elaborately argued by eminent counsel on both sides, the arguments consuming many days in delivery; that said suit was taken under advisement by the court, which thereafter rendered its decision, giving an elaborate opinion overruling all the defendants' defenses, holding said reissue letters patent valid, and directing a decree for the complainants, in conformity with the prayer of the bill of complaint, for an account of profits and damages, which decree was duly entered, a copy of which is hereto annexed, marked Exhibit A, and directing a perpetual injunction, which was duly issued, a copy of which is hereto annexed, marked Exhibit B, as by the record and proceedings in said suit now remaining in the office of the clerk of said court, or a duly-authenticated copy thereof, will appear.

And your orators further show unto your honors that since said adjudication numerous injunctions have been issued by said court against persons using said invention in infringement of said reissue letters patent.

And your orators further show unto your honors that your orators, William D. Andrews, George H. Andrews, and Nelson W. Green, being the owners of said reissue letters patent for the county of Hennepin, in the State of Minnesota, did, in the months of November and December, 1876, and January, 1877, file separate bills in the circuit court of the United States for the district of Minnesota against O. E. Spear, Joel B. Bassett, Sweet W. Case, Stephen Pratt, Robert L. Pratt, William L. Nichols, Anthony Kelly, George B. Wright, and De Witt R. Wagner for infringement of said reissue letters patent, and praying for injunction and account; that the several defendants appeared in the said suits by the same counsel and each filed the

same answer, denying the infringement, and setting up that the reissue letters patent were false, fraudulent, and untrue, and not for the same invention as patented and claimed in the original letters patent, and, therefore, void and of no effect; that your orator Green was not the first or original inventor of the invention patented by said reissue letters patent, and alleging that long prior to the invention thereof by said Green the same had been described in certain letters patent, applications for letters patent, and in many books, pamphlets, and publications, and that it had been long known and used by many persons in different parts of the United States; that said Green had forfeited his right to a patent by reason of the invention having been in public use and on sale for more than two years before his application for letters patent therefor; that any letters patent issued to Green were obtained by fraud and deceit, and that he had abandoned the invention and dedicated it to the use of the public.

That your orators filed replications to said answers and the court permitted the several defendants to unite their defenses, the evidence taken in one case to be used in all; that the suit against George B. Wright was selected for trial and a large amount of testimony was taken, nearly sixty witnesses having been examined in five different States during the months of August, September, October, November, and December, 1877; that said suit was brought to a hearing on pleadings and proofs, the entire evidence in the previous suit against Theodore A. Carman was submitted to the court, and the case thoroughly argued by able counsel in December, 1877; that the said suit was taken under advisement by the court, which thereafter rendered its decision overruling all the defendant's defenses, holding said reissue letters patent valid, and directing decrees for complainants, in conformity with the prayer of the bills of complaint, for an account of profits and damages, which decree was duly entered in each of the several cases, a copy of one of which is hereto annexed, marked Exhibit C, and directing perpetual injunctions, which were duly issued, a copy of one of which is hereto annexed, marked Exhibit D, as by the records and proceedings in said suits now remaining in the office of the clerk of said court, or duly-authenticated copies thereof, will appear.

And your orators further show unto your honors that since said adjudication by the circuit court of the United States for the district of Minnesota large numbers of injunctions have been issued by said court against persons using said invention in infringement of said reissue letters patent.

Yet the said defendant, well knowing the premises and the rights secured to your orators aforesaid, but contriving to injure your orators and to deprive them of the benefits and ad-
13 vantages which might, and otherwise would, accrue unto them from said invention, after the reissuing of said letters patent as aforesaid, and your orators becoming the owners of said reissue letters patent in, to, and for the said town of Orange, and before the commencement of this suit, did, as your orators are informed and believe, within the said district of Connec-

ticut, and without the license or allowance, and against the will of your orators, and in violation of their rights, and in infringement of the aforesaid letters patent, unlawfully and wrongfully, and in defiance of the rights of your orators, make, sell, and use wells embracing said invention in said town of Orange aforesaid, and that he still continues so to do, and that he is threatening to make, sell, and use the aforesaid wells in larger quantities, and to supply the market therewith, and to continue to use the wells as constructed by him, all in defiance of the rights acquired by and secured to your orators as aforesaid, and to their great and irreparable loss and injury, and by which they have been, and still are being, deprived of great gains and profits which they might and otherwise would have obtained, but which have been received and enjoyed and are being received and enjoyed by the said defendant by and through his aforesaid unlawful acts and doings.

And your orators further show unto your honors, on information and belief, that said defendant has one or more of said wells and is now using the same and has made and realized large profits and advantages therefrom, but to what extent and how much exactly your orators do not know, and pray a discovery thereof. And your orators say that the use of said invention by said defendant and his preparation for and avowed determination to continue the same, and his other aforesaid unlawful acts, in disregard and defiance of the rights of your orators, have the effect to encourage and induce others to venture to infringe said patent in disregard of your orators' rights.

And your orators further show unto your honors that they have caused notice to be given to said defendant of said infringements and of the rights of your orators in the premises, but he has disregarded said notice and still continues to make, sell, and use the same.

And your orators pray that said defendant, Harris Eames, and his servants, agents, attorneys, and workmen, and each and every of them, may be restrained and enjoined, by the order and injunction of this honorable court from directly or indirectly making, constructing, using, vending, delivering, working, or putting into practice, operation, or use, or in anywise counterfeiting or imitating the said invention, or any part thereof, or any wells made in accordance therewith, or like or similar to those which he has heretofore made or used, and that the said defendant may be decreed to pay the costs of this suit, and that your orators may have such further relief or such other relief as to this honorable court shall seem meet and as shall be agreeable to equity.

May it please your honors to grant unto your orators a provisional or preliminary injunction issuing out of and under the seal of this honorable court, commanding, enjoining, and restraining the said defendant, Harris Eames, and his servants, agents, attorneys, and workmen, and each and every of them, as is hereinbefore in that behalf prayed.

And forasmuch as your orators can have no adequate relief, except in this court, to the end, therefore, that the said defendant may,

if he can, show why your orators should not have the relief hereby prayed, and may, upon his corporal oath and according his best and utmost knowledge, remembrance, information, and belief, full, true, direct, and perfect answers make to the premises, and to all the several matters hereinbefore stated and charged, as fully and particularly as if severally and separately interrogated as to each and every of such matters, and that he may be compelled to account for and pay to your orators the profits by him acquired, and the damages suffered by your orators from the aforesaid unlawful acts, and that the court may assess said profits and damages and may increase the damages to a sum not exceeding three times the amount thereof:

14 May it please your honors to grant unto your orators the writ of subpœna issuing out of and under the seal of this honorable court, directed to the said defendant, commanding him by a certain day and under a certain penalty to be and appear in this honorable court, then and there to answer the premises and to stand to and abide such order and decree as may be made against him.

And your orators will ever pray, etc.

WILLIAM D. ANDREWS,
GEORGE H. ANDREWS,
NELSON W. GREEN,
By E. H. HYDE,
Their Attorney.

HYDE & JOSLYN,
Solicitors for Complainants.

——— ———,
Of Counsel.

UNITED STATES OF AMERICA, *District of Connecticut:*

On this 5th day of June, 1879, before me, appeared Homer T. Bissell, of Hartford, Conn., to me personally known, and who, being by me duly sworn, did depose and say that he is the agent for the State of Connecticut of the complainants above named; that he has read the foregoing bill in equity and knows the contents thereof, and that the same is true of his own knowledge, except as to matters therein stated on information and belief, and as to those matters he believes it to be true.

CHAS. M. JOSLYN,
Notary Public.

15 EXHIBIT A.

Circuit Court of the United States for the Eastern District of New York. In Equity.

At a stated term of the circuit court of the United States of America, in the eastern district of New York, in the second circuit, held at the court-rooms in the city of Brooklyn, on the second day of May, in the year of our Lord one thousand eight hundred and seventy-six.

Present: Hon. Charles L. Benedict, district judge.

WILLIAM D. ANDREWS, GEORGE H. ANDREWS, NELSON W. GREEN, ORLANDO BENNET, and PLATT CONKLIN

vs.

THEODORE A. CARMAN.

This cause having come on to be heard upon the bill of complaint herein, the answer thereto of the defendant, the replication of the complainants to such answer, and the proof, oral, documentary, and written, taken and filed in said cause, and having been argued at length by counsel for the respective parties—

Now, therefore, on consideration thereof, it is ordered, adjudged, and decreed, and the court doth hereby order, adjudge, and decree, as follows, to wit:

That the reissued letters patent No. 4372 granted to Nelson W. Green on the 9th day of May, 1871, for improvements in wells, being the letters patent referred to in the bill of complaint herein, are good and valid in law.

That the said Nelson W. Green was and is the first and original inventor and discoverer of the "improvement in wells" described and claimed in the said letters patent and the specification annexed thereto.

That the said William D. Andrews, George H. Andrews, Nelson W. Green, Orlando Bennet, and Platt Conklin are the exclusive owners of the said letters patent for the county of Queens, in the State of New York, within this district.

That the said Theodore A. Carman, the defendant herein, has infringed upon the said letters patent and upon the exclusive rights of the complainants under the same by the construction and use of wells as charged in said bill of complaint.

And it is further ordered, adjudged, and decreed that the complainants do recover of the defendant the profits, gains, and advantages which the defendant has received or made, or which have in any way arisen or accrued to him from the infringement of the said reissued letters patent, by practising, making, using, or selling the invention and thing patented, as described and secured by the said reissued letters patent No. 4372 since the grant and issue thereof on the 9th day of May, 1871, and also the damages which the complainants have or may have sustained by reason of any infringement of said reissued letters patent.

And it is further ordered, adjudged, and decreed that it be referred to B. Lincoln Benedict, Esq., special master, appointed by this court to ascertain and take and state and report to the court an account of the gains, profits, and advantages which the said defendant has received, or which has accrued to, or arisen to, him since the 9th day of May, 1871, from infringing the aforesaid exclusive rights of the said complainants by the construction and use of wells such as are described in the aforesaid reissued letters patent numbered 4372, and also to compute, assess, ascertain, state, and report the amount of damages which the complainants have sustained by reason of the said infringements.

And it is further ordered, adjudged, and decreed that the complainants have on such accounting the right to cause an examination of the said defendant *ore tenus*, or otherwise, and also the production of the books, vouchers, and documents of said defendant, and that said defendant attend for such purposes before said special master from time to time within this district as said master shall direct.

And it is also further ordered, adjudged, and decreed that a perpetual injunction be issued in this cause against the said defendant, Theodore A. Carman, restraining him, his agents, attorneys, clerks, servants, workmen, and all working or holding under or through him, from constructing or using wells such as are described in the aforesaid reissued letters patent, numbered 4372, pursuant to the prayer of said bill of complaint.

16 And it is further ordered, adjudged, and decreed that the complainants do recover of the defendant their costs and charges and disbursements of this suit, to be taxed.

CHAS. L. BENEDICT.

I certify the foregoing to be a true copy of the original decree entered in the above-entitled action.

[L. S.] B. LINCOLN BENEDICT, *Clerk.*

EXHIBIT B.

UNITED STATES OF AMERICA, }
Eastern District of New York, } ss.

I, B. Lincoln Benedict, clerk of the circuit court of the United States of America for the eastern district of New York, do hereby certify that the writings annexed to this certificate are true copies of their respective originals on file and remaining of record in my office.

In testimony whereof I have caused the seal of the said court to be hereunto affixed, at the city of Brooklyn, in the eastern district of New York, this thirty-first day of October, in the year of our Lord one thousand eight hundred and seventy-six, and of the Independence of the said United States the 101st.

B. LINCOLN BENEDICT, *Clerk.*

The President of the United States of America to Theodore A. Carmon, his clerks, attorneys, servants, agents, and workmen, Greeting:

Whereas it has been represented to us in our circuit court of the United States for the second circuit and the eastern district of New York that reissued letters patent of the United States were issued and granted in due form of law on the ninth day of May, in the year of our Lord one thousand eight hundred and seventy-one, to Nelson W. Green for improvements in wells, said letters patent being known and distinguished as "Reissue number 4372."

And that you, Theodore A. Carman, aforesaid, have infringed the rights secured by the aforesaid letters patent by constructing and

using wells contrary to the form of the statute in such case made and provided:

Now, therefore, we do strictly command and perpetually enjoin you, the said Theodore A. Carman, your clerks, attorneys, agents, servants, and workmen, under the pains and penalties which may fall on you, and each of you, that you forthwith desist and refrain from constructing or using wells such as are described in the said reissued letters patent numbered 4372.

Witness the Honorable Morrison R. Waite, Chief Justice of the United States of America, at the city of Brooklyn, this third day of May, in the year of our Lord one thousand eight hundred and seventy-six.

[SEAL.] B. LINCOLN BENEDICT,
Clerk, &c.

17 EXHIBIT C.

In the Circuit Court of the United States for the District of Minnesota. In Equity.

WILLIAM D. ANDREWS, GEORGE H. ANDREWS, and NELSON W. GREEN
against
GEORGE B. WRIGHT.

This cause came on to be heard at the December term of said court, A. D. 1877, upon pleadings and proofs, and was argued by the counsel for the respective parties, and the court having considered said pleadings, proofs, and arguments, upon due advisement it is now hereby ordered, adjudged, and decreed in this cause as follows:

That the reissued letters patent No. 4372 of the United States granted to said Nelson W. Green on the ninth day of May, 1871, for improvements in wells, being the letters patent referred to in the bill of complaint herein, are good and valid in law.

That the said Nelson W. Green was and is the first inventor and discoverer of the invention of the "improvements in wells," described and claimed in the said letters patent and the specifications annexed thereto.

That the complainants, said William D. Andrews, George H. Andrews, and Nelson W. Green, are the exclusive owners of the said letters patent for the county of Hennepin, in the State of Minnesota, within this district, and of all rights of action for infringement thereof.

That the said defendant herein, George B. Wright, has infringed upon said letters patent, and upon the exclusive right of the complainants under the same, by the construction or use of wells, as charged in said bill of complaint.

And it is further ordered, adjudged, and decreed that the complainants do recover of said defendant the profits, gains, and advantages which the said defendant has received or made, or which have in any way arisen or accrued to him from the infringement of the

said reissued letters patent, by practising, making, using, or selling the invention and thing patented or described and secured by the said reissued letters patent No. 4372, since the grant and issue thereof on the 9th day of May, 1871, and also the damages which the complainants have or may have sustained by reason of any infringements of said letters patent by said defendant.

And it is further ordered, adjudged, and decreed that it be referred to Horatio E. Mann, Esq., a master of this court, to ascertain and take and state and report to this court an account of the gains and profits and advantages which the said defendant has received or which has accrued to or arisen to him since the 9th day of May, 1871, from infringing the aforesaid exclusive rights of the said complainants by the construction of, dealing in, using, or selling the said wells, such as are described in the aforesaid reissued letters patent numbered 4372, and also to compute, assess, ascertain, state, and report the amount of damages which the complainants have sustained by reason of said infringement.

And it is further ordered, adjudged, and decreed that the complainants have on such accounting the right to cause an examination of said defendant and also the production of the books, vouchers, and documents of said defendant, and that said defendant attend for such purposes before said master, from time to time, within this district, as said master shall direct.

And it is also further ordered, adjudged, and decreed that a perpetual injunction be issued in this cause against the said defendant, George B. Wright, restraining him and his agents, attorneys, clerks, servants, workmen, and all working or holding under or through him, from constructing, selling, putting down, or using wells such as are described in the aforesaid reissued letters patent number 4372, pursuant to the prayer of said bill of complaint. And it is further ordered, adjudged, and decreed that complainants do recover of the defendant their costs and disbursements of this suit, to be taxed.

R. R. NELSON, *Judge.*

18 STATE OF MINNESOTA, } ss:
County of Ramsey, }

I, Horatio E. Mann, the clerk of the within-named circuit court of the United States for the district of Minnesota, as such clerk, do hereby certify that I have carefully compared the foregoing paper with the original decree on file and entered in the within-entitled cause, and of which, as such clerk, I am the custodian, and that the some is a true and correct copy and transcript of said original decree and of the whole thereof.

Witness my hand and the seal of this said court this July 10th, A. D, 1878.

H. E. MANN, *Clerk.*

EXHIBIT D.

In the Circuit Court of the United States, District of Minnesota.

The United States of America to George B. Wright, his agents, attorneys, clerks, servants, workingmen, and all working or holding under or through him, Greeting:

Whereas William D. Andrews, George H. Andrews, and Nelson W. Green have exhibited their bill of complaint before the judges of our circuit court of the United States for the circuit within and for the district of Minnesota against you, the said George B. Wright, praying to be relieved touching the infringement by you of their rights under reissued letters patent of the United States, granted and issued in due form of law, on the 9th day of May, 1871, to said Nelson W. Green, for "improvements in wells," said reissued letters patent being known and distinguished as "Reissue number 4372," and which were duly assigned to and are now owned by said William D. Andrews, George H. Andrews, and Nelson W. Green; and whereas by the decree of said court, entered on the tenth day of July, A. D. 1878, it was ordered, adjudged, and decreed that a writ of injunction issue under the seal of said court to restrain you and each and every of you from constructing, making, manufacturing, selling, putting down, or using any well or wells such as are described in said reissued letters patent No. 4372:

We, therefore, in consideration thereof, do hereby strictly command and perpetually enjoin you, the said George B. Wright, your agents, attorneys, clerks, servants, workingmen, and all holding under or through you, under the pains and penalties which may fall upon you, and each of you, in case of disobedience, that you forthwith cease, desist, and refrain from constructing, making, manufacturing, selling, putting down, or using, either by or for yourself, or as the servant or workingman of another, in violation of said reissued letters patent, any well or wells such as are described in said reissued letters patent No. 4372.

Whereof you are not to fail at your peril.

Witness the Honorable Morrison R. Waite, Chief Justice of the Supreme Court of the United States, at St. Paul, this twenty-second day of July, in the year of our Lord one thousand eight hundred and seventy-eight.

[U. S. court seal.]

H. E. MANN, *Clerk.*
LAMPREY & JAMES,
Complainants' Solicitors.

And on the same day a writ of subpœna issued out of court directed to the said respondent, which was duly served and returned, and which with the return of service endorsed thereon, was and is in the words and figures following, viz:

19 [SEAL.] The President of the United States of America to the marshal of the district of Connecticut sendeth greeting:

You are hereby commanded to summon Harris Eames, of the town of Orange, in the county of New Haven, and a citizen of the State and district of Connecticut, to appear before the judges of the circuit court of the United States of America for the district of Connecticut, in the second circuit, in equity, on the first Monday of July, 1879, wheresoever the said court shall then be, to answer a bill of complaint exhibited against said Harris Eames in said court by William D. Andrews and Brother, said firm consisting of William D. Andrews and George H. Andrews, doing business in the city of New York, in the State of New York, and Nelson W. Green, doing business in the State of Massachusetts, and then and there to answer the same and to do and abide by what said court may order and decree in the premises.

Make due service and return at least twenty days before said first Monday of July, 1879.

Witness the Hon. Morrison R. Waite, Chief Justice of the Supreme Court of the United States, at Hartford, this 6th day of June, A. D. 1879.

E. E. MARVIN, *Clerk.*

The defendant is required to enter his appearance in said cause in the clerk's office of said court on or before the day at which this writ is returnable, or, by the rules of said court, said bill will be taken as confessed.

E. E. MARVIN, *Clerk.*

HYDE & JOSLYN,
Complainants' Solicitors.

Hartford, Conn.

19½ UNITED STATES OF AMERICA.

DISTRICT OF CONNECTICUT, } ss:
New Haven County, }

ORANGE, *June* 7, 1879.

Then and there I served the within writ by delivering to and leaving with Harris Eames, herein named, a true and attested copy hereof.

Attest: JOS. D. BATES,
U. S. Marshal.

Fees:

Service	2 00
Copy & end	1 00
Team	50
Travel	5 28
	8 78

20 And on the same day Messrs. Hyde & Joslyn entered their appearance for the complainants, and on the 5th day of July, 1879, Messrs. Ingersoll & Hamilton entered their appearance for the defendant, and on the 16th day of September, 1879, defendant's answer was filed in the words and figures following, viz:

21 In the Circuit Court of the United States for the District of Connecticut. In Equity.

WILLIAM D. ANDREWS, GEORGE H. ANDREWS, and NELSON W. GREEN
versus
HARRIS EAMES.

The answer of Harris Eames, of the town of Orange, county of New Haven, and State of Connecticut, defendant to the bill of complaint of William D. Andrews, George H. Andrews, and Nelson W. Green, complainants in the above-entitled cause.

The defendant now, and at all times hereafter, saying and reserving to himself all benefit and advantages of exceptions to the many errors and insufficiencies in the complainants' said bill of complaint contained, for answer thereunto, or unto so much or such parts thereof as he is advised is or are material for him to answer unto, answering, says:

That he is informed and believes, and therefore admits, that letters patent of the United States for an alleged "improved
22 method of constructing artesian wells" were issued to the complainant, Nelson W. Green, at the time mentioned in said bill, and that said Green thereafter, at the time mentioned in said bill, obtained the reissued letters patent marked "Reissue No. 4372," but he denies that said original letters patent were surrendered to the Commissioner of Patents by said Green for good and lawful cause, or that the said Green made due application for said reissued letters patent or in all things pertaining thereto complied with the acts of Congress in such case made and provided, and on the contrary the defendant avers that said reissued letters patent are not for the same invention as that shown, described, and claimed in the said original letters patent, and that new matter has been introduced into the specification forming a part thereof, and that the surrender of the said original letters patent was made by said Green for the purpose of including in the said reissued letters patent such new matter, and more than he was entitled to include in his original letters patent and inventions, of which he was not at the
23 date of said original letters patent or his application therefor the first and original inventor, and, therefore, the said reissued letters patent are void.

And, further answering, the said defendant, upon information and belief, denies that the alleged improvement described and claimed in said original letters patent, or in said reissued letters patent, was patentable or the subject-matter of invention.

And the defendant, further answering, on information and belief, denies that the said Nelson W. Green was the first and original

inventor of the alleged invention referred to in said bill of complaint and described in either said original or reissued letters patent, or of any substantial or material part thereof. On the contrary, he avers that said alleged invention and all the material and substantial parts thereof were, prior to any alleged invention or discovery by said Green, described in certain letters patent and in certain applications for letters patent hereinafter particularly described, namely:

Letters patent of Great Britain, granted February 12th, 1805, to James Ryan, No. 2822. Letters patent of the United States,
24 No. 1869, granted Nov. 26, 1840, to E. Rice. The application for letters patent of the United States, filed in the Patent Office of the United States on or about the 15th day of November, 1863, of James Suggett, of the town of Cortlandville, in the State of New York. The application of S. R. and W. S. Hunter, of Cortlandville, in the State of New York, filed in the office of the commissioner of patent, on the 16th day of May, 1865. The application of Byron Mudge, of Cortlandville, in the State of New York, for letters patent filed in the Patent Office of the United States on the 10th day of August, 1865. Letters patent of the United States granted and issued to James Suggett, of Cortland, in the State of New York, dated March 29, 1864, No. 42126. Letters patent granted and issued to S. R. and W. S. Hunter, of said Cortland, dated May 16, 1865, No. 47727. Letters patent of the United States granted and issued to Byron Mudge, of said Cortland, dated October 24th, 1865, No. 50614. Letters patent of the United States granted and issued to H. R. and M. J. Barnes, of Watkins, New York, dated August 15, 1865. Letters patent of the United States granted and
25 issued to E. Ashdown and George W. Galpin, of Homer, New York, dated October 31st, 1865. Letters patent of the United States granted to G. D. Pettingill and L. H. Merriele, of Cortland, New York, dated November 14th, 1865. Letters patent of the United States granted and issued to James Suggett, of Cortland, New York, and dated February 6th, 1866. Letters patent of the Dominion of Canada granted and issued to R. Lambert, of the city of Montreal, Canada, and dated about July, 1865. Letters patent of the Kingdom of Great Britain and Ireland granted and issued to William Edward Newton, and dated August 25, 1865, No. 2178. Letters patent of the United States granted to Eben Hilyard, September 10, 1817. Letters patent of the United States granted P. Easton, February 10th, 1810. Letters patent of Great Britain and Ireland granted to John Goode, No. 4828, dated August 20, 1850, A. D. 1823. Letters patent of the United States granted to Lawrence H. Pott, bearing date January 29, 1850, No. 7060. Letters patent of the United States granted to Clarendon Williams, bearing date August 19, 1856, No. 15587. Letters patent of the United States granted to Levi Disbrow, bearing date November 2d, 1830, reissued October 20th, 1842, to Disbrow and Sullivan. Letters patent granted to J. Ridgway, bearing date July 16, 1842. Letters patent granted
26 to J. H. Ockenhausen, bearing date July 19, 1853, No. 1314. Letters patent of the United States granted to R. H. St. John,

dated February 27th, 1866, No. 52853. Letters patent of the United Kingdom of Great Britain and Ireland granted to John H. Johnson, dated November 30th, 1865, No. 3074. Letters patent of the United States granted to Andrew J. Edgett, dated Feb. 5, 1867. Letters patent of the United States granted to John Chandler, bearing date September 4, 1866, No. 57764, and letters patent of the United States granted to Charles Houghton and Robert Lewis, bearing date November 21st, 1865, No. 51051.

And the defendant, further answering, on information and belief says that the said alleged invention of said Green and all the substantial and material parts thereof were, in fact, well known and in public use long prior to its alleged discovery and invention by him and to his application for letters patent therefor, and that such knowledge and prior use were had by various persons in the United Stated, and among them by the persons and at the places hereinafter mentioned, to wit:

Albert L. Rollo, residing at Vineland, New Jersey, who had knowledge of the same at Cortlandville, in the State of New York and in the adjoining towns; James Suggett, Stephen R. Hunter, and
27 W. S. Hunter, both now deceased; Julius A. Graham, Henry Bates, Henry Mead, Edward Ashdown, James C. Carmichael, M. M. Waters, Horace Baker, Ebenezer Mudge, Ira V. Hicks, James Freeman, Henry Woodruff, and George N. Copeland, all of whom reside in the town of Cortlandville, in the State of New York, and who severally had knowledge of the same at Cortland village and in the towns adjoining said Cortlandville; Cornelius Brown and Mrs. C. E. Burgess, both of whom reside in the town of Marathon, in said State of New York, and who severally had knowledge of the same at Cortlandville aforesaid; Alfred Hallerty, residing at Fort Wayne, in the State of Indiana, who had knowledge of the same at Fort Wayne aforesaid; Robert Ogden, residing in the city of Dayton, State of Ohio, who had knowledge of the same at said city of Dayton; William E. Tallman, now deceased; Moses C. Tallman, Mrs. Moses C. Tallman, Abram Vanderburg, Theown Klock, Thomas J. Getman, John Wilbur, Edwin Wilbur, Charles White, George Taylor, Calvin Shepard, John D. F. Wolston, and John Hilligus, all residing in the town of Preble, Cortland county, in the State of New York, who severally had knowledge of the same at the town of Preble aforesaid.

Henry C. Tallman, residing at Tully, in the county of Onondaga and State of New York, who had knowledge of the same at said town of Preble.

28 James Wickham and George Wickham, both residing in the town of Dryden, in the county of Tompkins and State of New York, who severally had knowledge of the same at said town of Preble.

Edward Hall and Esther Hall, both residing at Beaver Dam, in the State of Wisconsin, who severally had knowledge of the same at said town of Preble.

Hezekiah Klock, residing near Washington, D. C., who had knowledge of the same at said town of Preble.

James Ready, residing in the town of Spafford, in the county of Onondaga aforesaid, who had knowledge of the same at said town of Preble.

John Earle, residing at Palmyra, in the county of Wayne and State of New York, who had knowledge of the same at said town of Preble; George Way, residing in the town of Fabius, in the county of Onondaga aforesaid, who had knowledge of the same at said town of Preble.

Ezra Aldrich, residing at Ithaca, in the county of Tompkins aforesaid, who had knowledge of the same at said town of Preble; Ezra Hilligus, residing in the town of Cortlandville, who had knowledge of the same at said town of Preble.

George G. Wood, Elihu L. Stanley, Lewis E. Lockling, Lucien B. Proctor, and Michael Murphy, all of whom reside at Dansville, in the State of New York, and who severally had knowledge of the same at Dansville aforesaid; Joseph C.
29 Burritt, James Reynolds, E. B. Cornell, Jesse Lord, L. V. B. Maurice, all of whom reside at Ithaca, in the State of New York, and who severally had knowledge of the same at Ithaca aforesaid; Solomon Bignall, residing at the city of Chicago, in the State of Illinois, who had knowledge of the same at the town of Webster, Wastenaw county, State of Michigan; Steven D. Newton and David H. Smith, both of Syracuse, in the State of New York, who had knowledge of the same at said Syracuse; R. Peck, of Afton, Chenango county, State of New York, who had knowledge of the same at Cortlandville and at said village of Afton, in said State; John T Mead, of Stockbridge, in the State of New York, who had knowledge of the same at Ithaca, in said State; Russell Perkins and James Clark, of Herkimer, in the State of New York, who had knowledge of the same at Herkimer aforesaid; A. Maxfield, of Minden, in the county of Montgomery, in the State of New York, who had knowledge of the same at Minden aforesaid.

Samuel J. Parker, residing at Ithaca aforesaid, who had knowledge of the same at Ithaca, Salina, Syracuse, and elsewhere in the State of New York; George Geddes and Thomas Spencer, of the city of Syracuse, in the State of New York, who had knowledge
30 of the same at said city of Syracuse and at said Salina; James J. Hunt, Jesse Montand Stengler, Jona Ball, and A. McW. Ridden, of Napiersville, Dupage county, in the State of Illinois, who had knowledge of the same at said Napiersville; Byron Mudge, residing at Le Mars, Plymouth county, in the State of Iowa, who had knowledge of the same at Cortlandville aforesaid and at Dryden aforesaid; Mr. Warren, of Webster aforesaid, who had knowledge of the same at Webster aforesaid; Richard R. Lambert, residing at Ann Harbor, in the State of Michigan, who had knowledge of the same at Cortlandville aforesaid and elsewhere; Stephen D. Wait, of New Bedford, in the State of Massachusetts, who had knowledge of the same at Martha's Vineyard, Duke's county, Massachusetts; at New Bedford, Massachusetts; at St. Augustine, Florida; at Titusville, Pennsylvania, and Hyde Park, Massachusetts; Harvey Lord, of Dansville, New York, who had knowledge of the same at Dansville

aforesaid; William D. Babcock, of Hartford, Connecticut, who had knowledge of the same at Newbury, in the State of Vermont; Henry B. Stebbins, of Boston, Massachusetts, who had knowledge of the same at Palmer, in the State of Massachusetts; Stetson S. Gilman, of Springfield, Massachusetts, who had knowledge of the same at Windsor Locks, in the State of Connecticut, at Dalton, at Pittsfield, at Springfield, at Boston, at South Hadley, all in
31 the State of Massachusetts; at Bennington, in the State of Vermont; at Providence, in the State of Rhode Island, and at various other places in the United States and Canada; George Sheppard, of Brooklyn, New York, who had knowledge of the same at Brooklyn aforesaid, at Canterbury, England, and elsewhere; William Sherwood, of New York city, who had knowledge of the same at Brooklyn aforesaid, at Canterbury, England, and elsewhere; William Sherwood, of New York city, who had knowledge of the same at New York city aforesaid; B. F. Corson, of Glencoe, in the State of Minnesota, who had knowledge of the same at Rochester, in the State of New York, and elsewhere; Charles Batchelder, residing at Keane, in the State of New Hampshire, who had knowledge of the same at Rochester aforesaid and elsewhere; Joseph Richardson, who resides at Glencoe, in the State of Minnesota, who had knowledge of the same in the State of Rhode Island; B. J. Wardenbury, of Minneapolis, in the State of Minnesota, who had knowledge of the same in Netherlands; William Dixon, who resides in Minneapolis, in the State of Minnesota, who had knowledge of the same at St. Anthony, in the State of Minnesota; Isaac P. Reeves and John G. Gluck, who reside in Minneapolis, in the State of Minnesota, who severally had knowledge of the same in St. Anthony,
32 in the State of Minnesota; William A. Clark, of Minneapolis, in the county of Hennepin, in the State of Minnesota, who had knowledge of the same in Jackson county, in the State of Iowa, and near Alabama Center, in the county of Genesee, in the State of New York; J. M. Underwood, residing in Minneapolis aforesaid, who had knowledge of the same in Kennebunk, in the county of York, in the State of Maine; H. D. Wood, of Minneapolis aforesaid, who had knowledge of the same at Stowe, in the State of Vermont; Randolph Washburne and Perry Stowe, both of Stowe, in the State of Vermont, who had knowledge of the same in Stowe, in the State of Vermont; B. F. Perry, residing at Minneapolis aforesaid, who had knowledge of the same at Middlesex, in the State of Vermont; Mr. Barnes, of Montpelier, in the State of Vermont, who had knowledge of the same at Middlesex aforesaid; James Snook, residing at Binghamton, in Broome county, in the State of New York, who had knowledge of the same at Lisle, in said Broome county; Albert S. Chamberlin, residing at Springfield, Massachusetts, who had knowledge of the same at Windsor Locks, Connecticut.

Duane A. Tinckelpaugh, who resides at Minneapolis, who had knowledge of the same at Fairbury, Livingston county, Illi-
33 nois; Stephen Barnes, J. Phillips, R. B. Amesbury, H. M. Gillett, John Zimmerman, and H. Remington, all residing at said Fairbury, who had knowledge of the same at Fairbury aforesaid;

Charles Evers, residing at Lexington, Illinois, who had knowledge of the same at Fairbury aforesaid.

John R. Lewis, residing at Piper City, Illinois, and Michael Fitz Morris, residing at Chatsworth, Illinois, who each had knowledge of the same at said Piper City (then called Brenton); O. W. Whitney, residing in Minneapolis, Minnesota, who had knowledge of the same at Elmira, in the State of New York; John W. Webster, who resides at said Minneapolis, who had knowledge of the same in the State of Illinois, at the mouth of Calumet creek, near Chicago.

J. O. Milne, residing at said Minneapolis, in the State of Minnesota, who had knowledge of the same at the town of Macedon, Wayne county, New York; J. M. Griffith, residing at said Minneapolis, in the State of Minnesota, who had knowledge of the same at Montgomery city, Missouri; L. D. Webber, residing at La Porte, Indiana, who had knowledge of the same at said La Porte; P. Donnelly, residing at Barrow station, Illinois, who had knowledge of the
34 same at Chatsworth aforesaid and along the line of the Peoria and Oquawka East Extension railroad, in the State of Illinois; H. R. Barnes and M. T. Barnes, residing at the village of Watkins, in the county of Schuyler and State of New York, who each had knowledge of the same at said village of Watkins.

John B. Yost, John J. Hooker, Mortimer Searles, Aaron Steele, Asa Camp, Stephen C. Burr, all residing at Omega, in the county of Tioga and State of New York, who severally had knowledge of the same at said Omega; B. Oltz, E. Vankirk, and J. P. Vankirk, all residing at Ithaca, in the State of New York, who severally had knowledge of the same at Ithaca aforesaid.

John Chandler, residing at Cold Water, Branch county, Michigan, who had knowledge of the same at said Cold Water.

L. Van Auden, residing at Mantorville, Dodge county, Minnesota, who had knowledge of the same at Homer, New York.

G. J. Verbeck, residing at St. Paul, Minnesota, who had knowledge of the same at Monmouth, Bradford county, Pennsylvania.

Charles G. Linville, residing at Dacorah, Iowa, who had knowledge of the same at Manhattan, Riley county, Kansas; at Perry,
35 Jefferson county, Kansas; at Medina, Jefferson county, Kansas, and at what is now Emporia, Lyon county, Kansas.

Vandalia Slater, Robert Scutt, Samuel R. Hunt, William Ward, J. P. Rowell, and A. W. Clark, all of whom reside in the town of Portage, at or near Hunt's Hollow, in the county of Livingstone, in the State of New York, who severally had knowledge of the same at the town of Portage aforesaid; Minerva Slater and John S. Slater, both residing at Washington, District of Columbia, who severally had knowledge of the same at Portage aforesaid.

Also many other persons who had knowledge of such use in said town of Portage, whose names and places of residence will be furnished to complainant's counsel at an early day hereafter.

Samuel J. Oakley, residing at Lake Crystal, Blue Earth county, Minnesota, who had knowledge of the same at the city of Dayton, in the State of Ohio.

Albert S. Chamberlin, residing at Springfield, Massachusetts, who had knowledge of the same at Windsor Locks, Connecticut.

Walter H. Brown, residing at Swan Lake City, Emmett county, Iowa, who had knowledge of the same at section six, township one hundred and seven, range sixteen, Dodge county, Minnesota.

36 H. A. Scandrett, residing at Fairbault, Minnesota, who had knowledge of the same at Brady's Bend, Armstrong county, Pennsylvania.

C. D. Belden, residing at Austin, Minnesota, who had knowledge of the same at Wautoma, Washara county, Wisconsin.

R. D. Hubbard, residing at Mankato, Minnesota, who had knowledge of the same or a farm then belonging to Jackson Brown in Yolo county, California.

Stephen D. Newton, residing at Salina, in the State of New York, who had knowledge of the same at Salina aforesaid.

Peter Mallory, now deceased, who resided, at the time of his death, in the city of Winona, Minnesota, and who had knowledge of the same at the outlet of Onondaga Lake, in the State of New York; also at Pithole, Venango county, in the State of Pennsylvania, and at said city of Winona, Minnesota.

Francis G. Siemers, now deceased, who resided, at the time of his death, at the city of Winona, in the State of Minnesota, and who had knowledge of the same at said city of Winona, Minnesota.

37 Louise Siemers, Charles Neidenhofen, Hans Luthye, and Samuel D. Van Gorder, all residing at said city of Winona, in the State of Minnesota, who severally had knowledge of the same at said city of Winona, in the State of Minnesota.

Gross Gates, residing at Saratoga, Winona county, in the State of Minnesota, who had knowledge of the same at Cortlandville aforesaid.

George Parish and Mr. Richards, both residing at Chatham, Buchanan county, Iowa, who each had knowledge of the same at Victor Flats, Ontario county, New York.

E. W. Purdy, residing at Independence, Iowa, who had knowledge of the same at Milwaukee, Wisconsin.

A. J. Lucky, residing at De Soto, Jefferson county, Missouri, who had knowledge of the same at Milwaukee, Wisconsin, aforesaid.

William Smith, residing at Hazleton, Buchanan county, Iowa, who had knowledge of the same at Broadhead, Green county, Wisconsin.

A. J. Barnhart, residing at Independence, Iowa, who had knowledge of the same at Schoolcraft, Kalamazoo county, Michigan.

Thomas H. Tyson, Thomas J. Morinus, George Worm, Samuel P. McEwen, Thomas Sherwood, Frank Trask, Perry Munson, D. S. Deering, S. S. Allen, A. F. Williams, S. M. Morquett, and

38 George B. Worm, all residing at Independence, Buchanan county, Iowa, who severally had knowledge of the same at Independence, Iowa, aforesaid.

Charles T. Kimball, residing at Jessup, Buchanan county, Iowa, who had knowledge of the same at Independence aforesaid.

Byron C. Hale, residing at Quasqueton, Buchanan county,

Iowa, who had knowledge of the same at Independence, Iowa, aforesaid.

Elias S. Hovey, residing at Swanton, Iowa, who had knowledge of the same at Independence aforesaid.

Alexander Baldwin and Joel Mallory, both residing at said city of Winona, in the State of Minnesota, who had knowledge of the same at Winona, Minnesota, aforesaid.

Charles Seward, residing at Farmington, Dakota county, in the State of Minnesota, who had knowledge of the same at the premises then occupied by one George Burnap, near Hillsborough, Montgomery county, Illinois.

C. D. Harn, residing at Janesville, Waseca county, in the State of Minnesota, who had knowledge of the same at Anoka, Anoka county, Minnesota.

C. R. Bushnell, residing at Minneapolis, in the State of Minnesota, who had knowledge of the same at Anoka, Minnesota, aforesaid.

J. H. Edlward, residing at Stillwater, Washington county,
39 in the State of Minnesota, who had knowledge of the same at the towns of Manlius and Rutland, in La Salle county, Illinois, and also in adjoining towns.

John Gum, residing at Marseilles, La Salle county, Illinois, who had knowledge of the same at said towns of Manlius and Rutland, in La Salle county, Illinois, and also in adjoining towns.

J. B. Waite, residing at Marseilles aforesaid, who had knowledge of the same at the town of Manlius aforesaid.

Jonathan Covell, residing at Brookfield, in said La Salle county, who had knowledge of the same at said town of Manlius.

Thomas Graham and Allen Yates, both residents of Decorah, Winneshiek county, Iowa, and E. B. Wolcott, residing at the city of Milwaukee, Wisconsin, who severally had knowledge of the same at the town of Wauwatosa, Milwaukee county, Wisconsin.

John G. Barthell, residing at Decorah, Iowa, who had knowledge of the same at Troy, Lansingburgh, and Green Island, New York.

F. Morgan, residing at Howard Lake, in the State of Minnesota, who had knowledge of the same at the premises then known as the Columbia House, on the Syracuse road, in Madison county, New York.

40 A. B. Evans, residing at the city of Rochester, in the State of Minnesota, who had knowledge of the same at Danville, Montour county, Pennsylvania.

A. H. Risdan, residing at Minneapolis, in the State of Minnesota, who had knowledge of the same at San Francisco, California, and Salina, Washtenaw county, Michigan.

Nathan L. Heath, residing at Brainerd, in the State of Minnesota, who had knowledge of the same at Montpelier, in the State of Vermont.

William R. Alexander, residing in the city of Quincy, Illinois, and Thomas C. Alexander, residing at Palestine, Crawford county, Illinois, who severally had knowledge of the same at Palestine aforesaid.

C. T. Bartlett, Chauncey Brixton, Timothy H. Brixton, Hiram Adams, A. Burr, Jabez B. Warren, and Spencer Crankite, all residing at Warsaw, Wyoming county, New York, who severally had knowledge of the same at Warsaw aforesaid; Orson Vande Walker, residing at Gainesville, Wyoming county, New York, and David Vande Walker, residing at Wethersfield Springs, Wyoming county, New York, who each had knowledge of the same at Wethersfield, in said Wyoming county.

George Warne, C. B. Handy, George B. Warne, George
41 Hovey, J. J. Travis, J. M. King, W. Wallace, A. H. Fonda, M. B. Ziems, John A. Davis, E. W. Purdy, Almon L. Francis, O. Marquette, Walton Hill, Samuel Parker, H. A. King, W. H. H. Morse, all residing at Independence, Iowa, who severally had knowledge of the same at Independence aforesaid; John Ganier, residing at Jessup, Iowa, who had knowledge of the same at Independence aforesaid; S. W. Fenstermaker, J. E. Traxler, and M. Rust, all residing at Waterloo, Iowa, who severally had knowledge of the same at Independence aforesaid; William Codling, residing at Fairbank, Iowa, who had knowledge of the same at Independence aforesaid; Thomas B. Webster, residing at Elizabeth, Union county, New Jersey, who had knowledge of the same in England and elsewhere.

Thomas White, residing in the city of Troy, Rensselaer county, State of New York, who had knowledge of the same at Green Island, in the county of Albany, in said State, and elsewhere in the State of New York; Dyer P. Mosher and Henry Edie, both residing in the town of Hoosick, in said county of Rensselaer, who had knowledge of the same at Hoosick aforesaid; Terry Witt and Daniel McElwaine, residing at North Adams, in the State of Massachusetts, who had knowledge of the same at North Adams afore-
42 said and other places in Berkshire county, in said State; Daniel P. Chesebrough, residing in the village of Lansingburgh, Rensselaer county, State of New York, who had knowledge of the same at Lansingburgh aforesaid; A. Homer Byington, residing in the town of Norwalk, county of Fairfield, in the State of Connecticut, who had knowledge of the same at Middletown, in the county of Orange, New York, and also at Norwalk aforesaid; Daniel H. Brown and Albert G. Seymour, both residing in the city of New Haven, in the county of New Haven, State of Connecticut, who had knowledge of the same at New Haven aforesaid; James E. Collins, residing in the city and county of St. Louis, in the State of Missouri, who had knowledge of the same at St. Louis aforesaid, and also at Indianapolis, Maine county, Indiana, and elsewhere.

And the defendant, further answering upon information and belief, says that the said alleged invention thereof by him, and long before his application for letters patent therefor, [was] described in the following printed publications, namely:

A report of Thomas Spencer, superintendent, and Henry W. Allen, concerning the salt wells and the method of sinking wells at Salina and Syracuse, New York, and dated January 9th, 1841; also another report dated January 8th, 1842.

43 Also a report made by Richard Wright and James M.

Allen, of Syracuse, concerning the salt wells of Syracuse and Salina, in the State of New York.

Also a report of the superintendent of the salt wells in Syracuse, State of New York, dated January, 1853, on pages 10 and 11 of which the material and substantial parts of said claimed invention were and are described.

Also a certain book or publication known as "McKenzie's Five Thousand Receipts," published by James King, Jr., and Brother, at Philadelphia, 1829, and being a republication from a London edition of the same work, on page 388, in which all the material and substantial parts of said claimed invention were and are described.

Also a certain book called and known as "Ure's Dictionary of Arts and Manufactures," published in 18—, on pages 65, 66, and 67 thereof, in which all the material parts of said claimed invention were and are described.

Also in volume 35 of a certain work known as "Ree's Cyclopedia," published in Philadelphia, about the year 1817, by Samuel F. Madford and others, being the first American edition of said work, under the head or article of "Spring Draining Pump" in
44 said volume; also in volume 5 of the above-entitled work, under the head or article of "Borer in Rural Economy," in which said volumes, and each of them, all of the material and substantial parts of said claimed invention were and are described; that the pages in said volumes are not numbered, but each article is referred to in the alphabetical order of subjects set forth in said volumes and can be easily found; that said volumes were originally printed and published in London, England, by Longman and others, in Paternoster Row, in the year 1813.

Also a book published by authority of the State of New York, entitled "The Transactions of the State Agricultural Society of the State of New York for the year 1859," wherein all of the material parts of said claimed invention are described on page 280.

Also in a certain report of Thomas Spencer, of Syracuse, in the State of New York, contained in the annual report of the New York State Agricultural Society for the year 1843 or 1848, on pages 8 and 9, in which all the material parts of said claimed invention are described.

Also in a certain publication known as the "Traité Sur les Puits Artésiens," by F. Garnier, published in 1826, on pages 207
45 to 209; also pages 149, 139, 159, 198, 199, 200, 210, 227; also in "Degonsie and Laurent's Guide du Sondeur," published at —— in the year ——, on pages —. In the "Polytechinsches Central Blatt," publised in Leipsic, Germany, in the yeary 1847, on pages 89 and following; also in the same publication for the year 1848, on pages 607 and following, and in the year 1856, on pages 885 and following; also in the French periodical magazine called "Moniteur Industriel," No. 1208, published in the year 1848, page —, &c.; also in "Le Genie Industriel," published in March, 1856, pages 122 and following; also in "Berg Bonn Schule," published in Erfurt, Germany, in the year 1843, on page —; also in "Zobard Bulletin du Musee de l'Industrie, published in France in 1846,

volume 9, pages 224 to 233, inclusive; also in "Schauplatz der Kunste und der Handwerke," published in the year 1853, volume 124, on pages 44 and following; also in "Brandt's Dictionary of Art, Science, and Manufacture," published at New York in 1843, pages 91 and 1333; also in the "London Mechanics' Magazine," volume 2, pages 14, 15, 16, and 60, published in 1824, and in volume 3, page 109, published in 1825; also in a certain publication known as the "Journal of the Franklin Institute," volumes 1 and 2, third
46 series, pages 29, 30, 31, 32, 33, and 34; also in same publication, volume 7, pages 92 and 127, and volume 11, pages 176 and 177, and volume 12, pages 12, 13, and 14, and volume 15, published in 1833, in which an "Article, descriptive, account, and remarks upon a patent or an improvement in the art of raising water from the interior of the earth, &c.," appears; also in same publication, volume 15, published in 1833, at pages 12, 13, 14, 15, 40, and 224, in which all the material parts of said claimed invention are described.

Also in "Prechtle's Technologische Encyclopedia," volume 3, pages 192 and 200 and following, published in 1821; also in "London Encyclopedia," volume 22, published in 1829, page 593; also in "Journal of National Philosophy, Chemistry, and the Arts," volumes 5 and 6, pages 28 and 29, published in 1802, and page 313; also in the "Bulletin of the Museum of Industry," published at Brussels in 1846, volumes 9 and 10, pages 224 and following; also in a book entitled "Essai sur les Moyens d' Elever et de Distribuer les Eaux, par M. Genieys," published at Paris in the year 1829, at pages — and following; also in a book published in London before the year 1840, called "Burnell's Well Digging and Pump Work,"
47 wherein are described, at pages — and following, all the material and substantial parts of said claimed invention.

Also in volume 35 of said Ree's Cyclopedia under the head or article of "Spring Draining" in said volume; also in volume 49 of said work under the head or article of "Well in Rural Economy;" also in volume 1 of plates, at plate XXXVII, "Borers," Fig. 2; also in a book published in London and New York in the year 1854, by George Virtue & Co., called "Cyclopedia of Useful Arts, Mechanics, and Chemical Manufacturing, Mining, and Engineering," on page 68 of volume I, all the material parts of said claimed invention are described; also in a book published in Philadelphia, by Isaac Pierce in the year 1866, called "Gregory's Dictionary of Arts and Sciences," under the title of "Borer;" also in Harper's Monthly Magazine, dated September, 1851, under the head of "Bored Wells in Mississippi;" also in a publication entitled a "Treatise on the Water-bearing Strata of London and Vicinity," by Professor Pestch, at pages —; also in a certain publication, by M. Arago, entitled "Notices Scientifiques Annuaires du Bureau des Longitudes," published in the year 18—; also in a certain publication called the "Living Age," volume 10, page 153; volume 3, page 68; also in the "American
48 Quarterly Review," volume 22, page 330; also in the "Journal of Science," volume 12, page 136; also in a certain work called "Les Puits Artésiens des Oasis Meridionales de l'Algérie,"

second edition, 12mo., published in the year 1861, par Berbrugger, at page —; also in the "American Journal of Science and Art," published in the year 1859, at page —; also in "Beardman's Manual of Hydrology," at page —; also in a publication entitled "Notice by General Devoux in the Annales de Mines," published in the year 1858; also in a work entitled "Herical de Thury Considerations sur la cause du Jaillissement des Eaux des Puits Fores," published in Paris, France, in the year 1829; also in a certain work entitled "Von Brockenaus Ueber Artesische Brunnen," Heilb, published in the year 1833, at page —.

All of which publications were so printed and published as to be accessible to the public.

And the defendant, further answering, on information and belief, says that the said Nelson W. Green surreptitiously and unjustly obtained the said letters patent for that which was in fact invented
49 by one Byron Mudge, who was using diligence in perfecting and adopting the same, and who obtained a patent therefor on or about the 24th of October, 1865, and that therefore the said letters patent so obtained by said Green are void.

And the defendant, further answering, on information and belief, denies that the alleged invention of said Green had not "been for more than two years before his application for said letters patent in public use or on sale with his consent and allowance, and, on the contrary, avers that said alleged invention and all the material and substantial parts thereof were for more than two years before his said application in common public use and on sale in a large number of towns in the State of New York and elsewhere, and particularly in Cortland and Cortland county, in said State, and by the following, among other persons, at said Cortland, viz: James Suggett, Julius A. Graham, Avery Seaman, Allen B. Smith, Charles H. Parker, Geo. N. Copeland, William Winters, Henry Bates, M. Michelson; and the defendant avers, on like information and belief, that the said Nelson W. Green had knowledge of said use, and long before his application for a patent acquiesced therein and abandoned any claim, if any he had, to such alleged invention, and to any right, if any he had, to letters patent therefor.

50 And the defendant, further answering, says that he has no knowledge, save by said bill of complaint, whether or not the complainants have ratified and adopted said reissued letters patent or whether or not said letters patent, or any portion thereof, have been conveyed to the other complainants in said bill by said Green, by mesne assignments, or otherwise, or whether or not the complainants, or either of them, have ever made, sold, or constructed any wells under said letters patent of the character therein described, or have expended large sums of money in connection therewith, as stated in said bill, and he leaves the complainants to make such proof thereof as they may be advised is necessary; but the defendant denies, upon information and belief, that by virtue of said letters patent and the mesne assignments recited in said bill the said complainants became and were vested with any rights or privileges in or to said alleged invention, or that any construction or sale of wells

by the complainants or investment of money in connection therewith, as stated in said bill, has been to the benefit and advantage of the public, and avers that the public have not acquiesced in or acknowledged the validity of said letters patent or the pretended rights of the complainants, as set forth in said bill.

51 And the defendant, further answering, says that he has no knowledge, save by said bill of complaint, whether or not a suit was commenced in April, 1872, by said complainants, in connection with one Orlando Bennett and Platt Collins, against Theodore A. Carman in the circuit court of the United States for the eastern district of New York, and whether or not such proceedings were had therein as stated in said bill; nor has he any knowledge, save by said bill, whether or not a suit was commenced in November and December, 1874, and January, 1877, by said complainants against George B. Wright and others in the circuit court of the United States for the district of Minnesota, or whether or not such proceedings were had therein as stated in said bill; nor has he any knowledge, save by said bill, whether or not, since the alleged adjudication, injunctions have been issued by said courts against persons using said claimed invention, but he leaves the complainants to make such proof of the said allegations in that respect as they may be advised is necessary.

And the defendant, further answering, admits that he has in use two wells on his premises, in the town of Orange, county of

52 New Haven, in the State of Connecticut, and that he still continues to use the same, but, on information and belief, he denies that in the use of said wells, by himself and agents or servants, he in any manner employs or makes use of the alleged invention of said Nelson W. Green, as set forth in said bill of complaint; and he denies that the well so used by him is an infringement of the letters patent granted to the said Green aforesaid, or of any of the rights of the complainants, and avers that he has done nothing unlawful whereby the said complainants have suffered any loss or damage.

And the defendant, further answering, says that he denies that the said complainants are entitled to any relief in the premises.

And the defendant prays to be hence dismissed with his reasonable costs and charges in this behalf most wrongfully sustained.

HARRIS EAMES.

C. R. INGERSOLL,
Solicitor for Defendant & of Counsel.

53 UNITED STATES OF AMERICA, } ss:
District of Connecticut, }

On this twenty-seventh day of August, A. D. 1879, before me personally appeared Harris Eames, who, being by me duly sworn, deposes and says that he has read the foregoing answer subscribed by him and knows the contents thereof, and that the same is true of his own knowledge, except as to the matters therein stated on in-

formation and belief, and as to those matters he believes it to be true.

[NOTARIAL SEAL.] CHAS. S. HAMILTON,
Notary Public.

54 And on the 15th day of October, 1879, complainants' replication was filed, in the words and figures following, viz:

55 *Replication.*

In the Circuit Court of the United States for the District of Connecticut. In Equity.

WILLIAM D. ANDREWS, GEORGE H. ANDREWS, and NELSON W. GREEN
vs.
HARRIS EAMES.

The replication of the above-named complainants to the answer of Harris Eames, defendant.

These repliants, saving and reserving to themselves now and at all times hereafter all and all manner of benefit and advantage of exception which may be had or taken to the manifold insufficiencies of the said answer, for replication thereunto say that they will aver, maintaintain, and prove their bill of complaint to be true, certain, and sufficient in the law to be answered unto, and that the said answer of the said defendant is uncertain, untrue, and insufficient to be replied unto by these repliants, without this, that any other matter or thing whatsoever in the said answer contained material or effectual in the law to be replied unto, and not herein and hereby well and sufficiently replied unto, confessed, and avoided,
56 traversed or denied, is true; all which matters and things these repliants are and will be ready to aver, maintain, and prove as this honorable court shall direct, and humbly pray as in and by their said bill they have already prayed.

October 10th, 1879.

HYDE & JOSLYN,
Solicitors for Complainants.

56½ [Endorsed:] No. 173. U. S. circuit court, district of Connecticut. In equity. William D. Andrews, George H. Andrews, and Nelson W. Green *vs.* Harris Eames. Replication. Filed October 15, 1879. E. E. Marvin, clerk, per J. S. D. Copy.

57 U. S. Circuit Court, Dist. of Connecticut. In Equity.

ANDREWS *vs.* EAMES.

The defendant amends his answer in the above-entitled case by adding the following printed publications to those specified in the answer as containing a description of the alleged invention prior to the supposed discovery thereof by N. W. Green:

"The Repertory of Patent Inventions," &c., published in London, by T. and G. Underwood, in 1827, at pages 113, 114, 115, 116 of the fourth volume.

Brande's Dictionary of Science, Literature, and Art, published by Harper and Brothers, in New York city, in 1843, at page 1333.

Ure's Dictionary of Arts, Manufactures, and Mines, published in New York city by D. Appleton & Co. in 1847, at pages 63, 66, 67.

"De l'Art des Fontenies Sondeus il des Puits Artesienner," published in Paris in 1826, written by F. Garnier, at page 99 *et seq.*

A certain publication entitled "Le puits forets," being part
58 of "Les Œnores Arago," published ——, at page 457 *et seq.*, volume 6.

A certain printed publication, entitled "Well Digging and Boring," published in London, England, by George Swindel, p. 52.

A certain printed publication, entitled "An Encyclopedia of Domestic Economy," by D. M. Rees, published by Harper and Brothers in New York in 1849, at p. 550 and p. 848.

58½ And on the 14th day of July, 1882, complainants' and defendant's evidence was filed in the words and figures following, viz:

59 United States Circuit Court, District of Connecticut. In Equity.

WILLIAM D. ANDREWS *et al. vs.* HARRIS EAMES.

Testimony on behalf of complainants for final hearing, taken to be used upon the same under the 67th rule in equity, before E. E. Marvin, special examiner, at the office of C. R. Ingersoll, Esq., at New Haven Conn., November 27th, 1880, commencing at 9.30 a. m.

Present: E. H. Hyde, solicitor for complainants, and Hon. C. R. Ingersoll and C. S. Hamilton, solicitors for the respondent.

Counsel for both parties jointly instruct the said examiner to enter upon the minutes that it is mutually agreed between them that the proofs now taken before him may be taken by him, filed in court in the above-entitled case, and be used therein on final hearing in all respects to as full effect as if he had been heretofore appointed by the court special examiner in this case.

Complainants' counsel place in evidence certified copy of reissue letters patent granted Nelson W. Green, May 9th, 1871, No. 4372, which is marked "Green Reissue."

60 Also an assignment from Nelson W. Green of patent to Wm. D. Andrews and Geo. H. Andrews, composing the firm of Wm. D. Andrews & Brother, two of the complainants in this case, of an undivided half interest in patent 4372, and also certified copy of power of attorney from Nelson W. Green to Wm. D. Andrews & Brother, which is upon the same paper with the beforementioned assignment, which together is marked "Assignment and Power of Attorney."

FREDERICK B. PLATT sworn:

Q. 1. What is your name, residence, age, and occupation?

A. My name is Frederick B. Platt; my age is 57; residence, New Haven, and occupation—I call it farmer.

Q. 2. What was your occupation in 1870?

A. It was the same then; I had a few acres of land that I worked on.

Q. 3. State whether at any time you were engaged in the occupation of constructing wells; and, if so, during what years, and whether alone or with some other person, and if with some other person jointly, state with whom.

A. I worked with Mr. Daniel Clark putting down these wells; we commenced right away after we received this assignment, on August 25th, 1870, and worked at it occasionally as we had orders for the wells; three or four years, I should think. We bought a right together and worked together.

Q. 4. Where did you put down these wells?

A. In New Haven county.

Q. 5. How many of these wells did you put down, according to your best recollection?

A. I don't know whether we put down a hundred or more, because I have no recollection of it.

Q. 6. State fully and particularly the process used by you in constructing these wells.

A. We had a hollow auger that bored a hole about three inches in diameter, with which we bored the hole till we struck
61 water; then we coupled the pipe together, and either drove or pressed the pipe into the water below the strainer.

Q. 7. What do you mean by driving or pressing the pipe into the water below the strainer?

A. I mean by driving the pipe, striking it on top with a maul, and by pressing it; we put a chain on the pipe above, and used a lever with a purchase to push it down; this was done after the hole was bored.

Q. 8. How was your pipe constructed?

A. There were holes drilled through the pipe and a strainer inserted inside of the pipe up about two feet from the lower end generally.

Q. 9. State what, if anything, was attached to the lower end of the pipe.

A. A point screwed onto the lower end.

Q. How far did you ordinarily drive or press the pipe?

A. 10. From three to five feet.

Q. 11. Into what did you drive or press the pipe?

A. Into the wet sand.

Q. 12. What, if anything, did you ordinarily attach to the upper end of the pipe?

A. Generally a No. 2 Douglass pitcher pump.

Q. 13. Do you know Harris Eames, the defendant in this case?

A. Yes, sir.

Q. 14. State whether you were ever employed by him to construct these wells, and, if so, when and where, and how many of them you constructed.

A. Daniel Clark and myself were employed by Mr. Eames to construct two wells in West Haven, First avenue, in the basement in a double house; I think it was in 1871—the date I am not sure about.

Q. 15. Who worked with you in constructing these wells?

A. Daniel Clark.

Q. 16. State where in the basements both wells were.

A. In the rear of the house; the partition ran through the center, and one was one side of it and one the other.

62 Q. 17. Did you construct them both at the same time?

A. Yes.

Q. 18. How was the house situated—east and west or north and south?

A. The house stands on a corner, I believe; facing the east, I think.

Q. 19. Are the basements on the north and south sides of the house or east and west sides of the house?

A. I should call them on the west side of the house—one on the north corner and one on the south corner.

Q. 20. Describe fully and particularly the process used by you in constructing these wells, specifying what difference there was, if any, between them.

A. I don't know as there was any difference from what I have described. We bored a hole, as I said before, in the ground to the water, inserted the pipe, and either drove or pressed the pipe into the water from three to five feet, and attached a pump to the top—a pump constructed for a driven well, I believe.

Q. 21. What do you mean by into the water?

A. The water in the ground.

Q. 22. You did not strike a solid body of water, did you?

A. I struck water enough to supply the pump; that was all we was after, generally.

Q. 23. Do you mean by into the water into the water-bearing stratum of the earth?

A. I suppose so.

Q. 24. What was your object in driving or pressing the pipe in the manner which you have testified?

A. To get a supply of water for the pump.

Q. 25. State whether or not a supply of water was furnished for the pump before the pressing or driving took place.

A. It was not.

63 Q. 26. How far or how deep did you bore for these wells before inserting the pipe?

A. We bore until we struck water; sometimes more, and sometimes less.

Q. 27. State, if you can, how many, or about how many, feet you bored into the earth before inserting the pipe in constructing each of the two wells which you put down for the defendant.

A. I should think from twelve to fourteen feet.

Q. 28. In constructing these two wells, after removing the auger used in boring, state how many, or about how many, feet you drove or pressed the pipes in each of these wells into the water-bearing stratum of the earth.

A. About four feet, I should think.

Q. 29. State whether or not, after driving or pressing the pipes, as you have testified to, you removed any earth upward in constructing these wells.

A. No, sir.

Q. 30. State the manner in which you attached the pumps to the pipes in the defendant's wells.

A. With a coupling.

Q. 31. State whether or not you derived a supply of water from these two defendant's wells.

A. We did.

Q. 32. State, if you know, whether these wells, or either of them, have been in successful operation since their construction.

A. I don't know, sir.

Cross-examined by Mr. INGERSOLL:

C. Q. 33. You say that in constructing these wells for the defendant you bored till you struck water; how did you know when you had struck water?

A. When we took out the sand it was wet when we struck water; before we struck it the sand was dry.

C. Q. 34. Have you any particular recollection of these cases, enabling you to testify definitely on this point?

64 A. Yes, sir; we always made a practice of striking water before inserting the pipe in the bore.

F. B. PLATT.

Subscribed and sworn to before me this 27th day of Oct., A. D. 1880.

E. E. MARVIN, *Ex'm'r.*

HARRIS EAMES sworn:

Q. 1. What is your name, age, residence, and occupation?

A. My name is Harris Eames; I am in my 74th year; my residence is in West Haven, First avenue, and I have worked at tanning and currying for about 60 years, with about six months' intermission.

Q. 2. State whether you ever employed Frederick B. Platt and Daniel Clark to construct some wells for you, and, if so, when and where the wells were constructed.

A. I did employ them, I think, nine years ago this fall; I am not positive about the date; they were constructed in my double dwelling-house on First avenue, front of my dwelling-house in West Haven.

Q. 3. Are these the only wells they ever constructed for you?

A. Yes, sir.

Q. 4. Was a supply of water obtained from them?

A. A supply that we put up with, but not a satisfactory supply.

Q. 5. Are you now the owner of the house where these wells are situated.

A. Yes, sir.

Q. 6. State whether the wells, or either of them, have been in operation from the time when they were constructed until now, and in use.

A. Most of the time.

65 Cross-examined by Mr. INGERSOLL:

C. Q. 7. State whether or not the houses in which these wells are constructed have been occupied by you.

A. They have not; they have been occupied by tenants. My son has occupied one of them; different tenants have occupied the other; Mr. O'Seen, a Swede, has occupied it the last year.

C. Q. 8. When was the claim of these complainants that you were infringing any patent of theirs by the construction of these wells first brought to your notice?

(Objected to, on the ground that it is in reference to a matter not inquired of the witness in chief.)

A. I could not tell the time. I judge it was about a year ago; I could not tell exactly.

Re-examined by Mr. HYDE:

R. D. Q. 9. Has your tenement house any other source of water supply except these wells?

A. They have no cistern; but they come across to my house for water occasionally, frequently.

R. D. Q. 10. Are these wells the only source of water supply connected with the premises?

A. They are.

R. D. Q. 11. Did you receive notice that these wells were an infringement upon the complainants' patent, together with a demand of royalty, before this suit was brought?

A. I received notice that these wells were an infringement, and that I must pay ten dollars license for each of them, at some short time previous to the bringing of the suit.

R. D. Q. 12. Was that the only notice of that character that you ever received before this suit was brought?

A. I do not recollect of but one notice.

66 R. D. Q. 13. When did you first become aware that wells of this general character were claimed to be covered by a patent?

(Objected to as irrelevant.)

A. About the time I employed these men to put these wells down. I understood it was a patent they had. I do not know how I got the information.

HARRIS EAMES.

Subscribed and sworn to before me this 27th day of Nov., A. D. 1880.

E. E. MARVIN,
Examiner.

DANIEL CLARK sworn:

Q. 1. What is your name, age, residence, and occupation?

A. My name is Daniel Clark; I am 64 the 6th day of December; reside in Elm street, West Haven; occupation, farmer.

Q. 2. State whether or not you were engaged jointly with Mr. Frederick B. Platt in the construction of wells in New Haven county; and, if so, during what time.

A. I was, after Aug. 25, 1870; I could not tell how soon after; I was with him constructing wells for some three to four years.

Q. 3. Were the wells which you were engaged in constructing known by any special name; and, if so, what?

A. Well, I supposed according to the tube I bought it was a tubular well.

Q. 4. State whether you constructed, with Mr. Platt, any wells for the defendant; and, if so, where, how many, and when.

A. I constructed two with Mr. Platt, for Mr. Eames, on First avenue, West Haven; I could not tell when it was exactly; I think in 1870 or 1871.

Q. 5. Please describe fully and particularly the process used by you in constructing the defendant's wells.

67 A. First we bored with a three-inch auger down to water; then we coupled the pipe together with the well-tube with the point on it, and then either drove it or pressed it down—I could not say which; I don't recollect—from three to five feet; probably about four feet; I could not recollect; sometimes we pressed it down three feet, sometimes four feet, sometimes five feet; I could not recollect; we put on a Douglass pump; I could not say whether it was No. 1 or No. 2; we generally used No. 2 to it.

Q. 6. Please describe the construction of the bottom part of the tube you used.

A. It was one and a quarter inch pipe, with quite a number of holes drilled from an inch from the threads up two feet; the strainer was two feet long; then we lined it with fine wire cloth inside and perforated brass inside of that.

Q. 7. After driving or pressing the pipe, did you remove any earth upward?

A. No, sir.

Cross-examined by Mr. INGERSOLL:

X Q. 8. In making these tubular wells, how did you know when you had reached the water by boring?

A. The auger would be wet and the sand that come up with it would be wet—some little sand that come up.

X Q. 9. Did these appearances of water vary in different cases and in different localities—that is to say, would the auger be more

wet and the sand that come up be more wet in some cases than in others?

A. We had to bore in some places deeper to find water than in others, but when we came to water we always found some fragments on the auger to be wet—sometimes it would be a little bit of sand and sometimes a little bit of clay.

X Q. 10. And would the evidences of water on the auger be generally the same?

A. It would, as a general thing, sir. If you should dip a thing that was dry into a pail of water you would generally see the water on it.

68 X Q. 11. And did you generally look for such evidences of water before you stopped boring?

A. I did, sir.

X Q. 12. Do you recollect whether this was so in the particular case of the defendant's wells?

A. I do sir.

DANIEL CLARK.

Subscribed and sworn to before me this 27th day of Nov., A. D. 1880.

E. E. MARVIN,
Examiner.

United States Circuit Court, District of Connecticut. In Equity.

WILLIAM D ANDREWS *et al. vs.* HARRIS EAMES.

Testimony for final hearing on the part of complainants taken before Charles G. Coe, a notary public for the city, county, and State of New York, on the 14th day of April, 1882.

Parties met pursuant to verbal agreement between counsel Friday, April 14th, 1882, at 10 o'clock a. m., at the office of William D. Andrews & Bro., No. 233 Broadway, in the city of New York.

Present: Joseph C. Clayton, Esq., and William D. Andrews, on the part of complainants, and Charles S. Hamilton, Esq., on the part of defendant.

WILLIAM D. ANDREWS, a witness of lawful age, being produced on the part of complainants, being duly cautioned and sworn, deposes as follows:

69 Q. 1. State your name, age, residence, and occupation.

A. William D. Andrews; age, 64; residence, Brookhaven, L. I.; occupation, manager of the driven well patent and maker of driven wells, and am one of complainants in this cause.

Q. 2. How long have you been manager of the driven well patent? State the extent of your practical experience and knowledge in the construction and operation of hydraulic machinery of driven wells and of other wells.

A. I have been manager of the driven well patent since July, 1873; I had for thirty-five years previously been engaged in the use

and manufacture of pumps of various descriptions, and have taken out quite a number of patents upon pumps and similar machinery of my own invention, and inaugurated new methods in the making and use of hydraulic machinery; since 1873 I have been familiar with and practically interested in the making of driven wells.

Q. 3. Please give two or three of the principal instances within your knowledge of the use on a large scale of the invention described in the patent in suit.

(Objected to.)

A. At Belleville, New Jersey, some sixty tubes have been operated in connection with one pump; at the New York gas works, near the foot of 20th street, in the city of New York, there are two gangs of wells in operation, put down by my firm, the one gang consisting of some eight tubes and the other of about an equal number; a gang of wells are also in use in the telegraph building, cor. Dey and Broadway, New York city; they are also in use in this immediate vicinity, in the Herald building, United States post office, Astor House, Morse building, Vanderbilt building, and numerous other places both in this vicinity and throughout this city and Brooklyn.

70 Q. 4. To what extent are driven wells, according to N. W. Green's invention described in the patent in suit, in general use throughout the country?

(Objected to.)

A. That *it* is hard to specify, but I can say that large numbers of them are in use in the New England States, New York, Pennsylvania, and most of the Western States, extensively in New Jersey, and probably more or less in nearly every State in the Union. From estimates made by our agents, by well-drivers, and others having more or less knowledge in regard to the matter, I suppose and believe that the number of driven wells throughout the United States to be somewhere between five hundred thousand and a million.

Q. 5. Have you, and if so, how frequently about, been examined as an expert in patent cases?

A. But once or twice, excepting in regard to the driven well patent, in which cases I have been examined in the causes of Andrews *et al. vs.* Wright, tried in Minnesota; in the cause of Hine & Stephenson *vs.* Wahl, tried in Indiana; in the cause of Andrews *et al. vs.* Hovey and others, now pending in the district of Iowa; in the cause of Andrews *et al. vs.* Cone, now pending in the Minnesota district, and my testimony is in several driven well causes, but I think that in the other causes it was stipulated in from some of the causes I have named.

Q. 6. Have you carefully read and do you understand the descriptions or devices described in the patents and publications offered in evidence by the defendant in this case, to wit:

1. Copy of original U. S. letters patent granted to N. W. Green Jan. 14, 1868, No. 73425, marked "Def't's Exhibit No. 1." (Certification waived.)

2. Copy of U. S. letters patent granted to James Suggett March 29, 1864, No. 42126 (certification waived), marked "Def't's Exhibit No. 2."

71 3. Copy (certification waived) U. S. Patent Office file wrapper and contents, application of N. W. Green for reissue letters patent No. 4372, dated March 9, 1871, marked "Def't's Exhibit No. 3."

4. Copy English patent granted to John Goode, Aug. 20, 1823, No. 4838, marked "Def't's Exhibit No. 4."

5. Extract from a printed publication entitled "Repertory of Patent Inventions," vol. 4, published in London in 1827 by F. and G. Underwood, at pages 113–116, marked "Def't's Exhibit No. 5."

6. Extracts from "Dictionary of Arts (Ure), Manufactures, and Mines" published in New York city by D. Appleton & Co., in 1847, at pages 63, 66, 67, marked "Def't's Exhibit No. 6."

7. Extract from "McKenzie's 5,000 Recipes in all the Useful and Domestic Arts," published as early as 1840, at page 338, marked "Def't's Exhibit No. 7."

8. Extract from "Rees' Cyclopædia," published at Philadelphia, Pennsylvania, by S. D. Bradford, 1819, vol. 40—title, "Well in Rural Economy"—marked "Defendant's Exhibit No. 8."

9. Extract from "Journal of the Franklin Institute," third series, published at Philadelphia by the Franklin Institute, 1844, vol. 7, page 128, marked "Defendant's Exhibit No. 9."

10. Extract from "Brand's Encyclopædia or Dictionary of Science, Literature, and Art," published by Harper Bros., in New York city, in 1843, vol. 3, page 1333, under art. Well marked "Defendant's Exhibit No. 10."

72 11. Extract from "Rees' Encyclopædia," published at Philadelphia about 1819 by S. D. Bradford, vol. 35—title, "Spring Draining Pump"—marked Defendant's Exhibit No. 11."

12. Extract from "London Encyclopædia," published by Thomas Tegg at London, England, 1829, vol. 22, page 593, marked "Defendant's Exhibit No. 12."

13. Extract from "Mechanics' Magazine," published by Knight & Lacey, London, England, in 1824, vol. 2, pages 15, 16, 60, marked "Defendant's Exhibit No. 13."

14. Extract from "Harpers' New Monthly Magazine," published by Harper Bros., New York, September, 1851, page 540, marked "Defendant's Exhibit No. 14."

15. Extract from "De l'Art du Fontenier Sondeur et des Puits Artesiens," published in Paris, France, in 1822, at sections 79, 80, 88, 91, 94, 95, and also a translation of the same extract into English, it being agreed that this translation, as well as all other translations put in evidence under this stipulation, have been made by a person who believes himself to have a proper acquaintance with such languages for that purpose, this extract and translation being marked "Defendant's Exhibit No. 15."

16. Extract from "Bulletin du Musee de l'Industrie," published by De Mat & Co., at Brussels, in 1846, vol. 10, page 163, and translation of same, marked "Defendant's Exhibit No. 16."

17. Extract from "Hericart de Thury Jaillisement des Eaux," published by Bachellier, in Paris, France, in 1829, pages 274, 275, 24, 25, 26, 27, and translation of same, marked "Defendant's Exhibit No. 17."

18. Extract from "F. Arego Oeuvres," published at Paris,
73 France, by Gide & J. Baudey, and at Leipsic by T. O. Weigel, 1856, vol. 6, page 457, and translation of same, marked "Defendant's Exhibit No. 18."

19. Extract from "F. Garnier Traite sur les Puits Artesiens," published by Bachellier, Paris, France, 1826, pages 207, 209, 210, 227, 228, and also translation of same, marked "Defendant's Exhibit No. 19."

20. Extract from "Encyclopædia of Domestic Economy," published in New York city, in 1849, by Harper Bros., page 848, marked "Defendant's Exhibit No. 20."

A. I have read copies of all the exhibits above referred to, twenty in number, comprising the entire record of the defendant in this cause, Nos. 15, 16, 17, 18, and 19 being translations from the French, the originals of which are also in evidence; but I am not conversant with the French language, and testify mainly in regard to the exhibits named from the copies of translations thereof as furnished by the defendant. I understand the descriptions so far as they are understandable in the absence of the connecting text and figures therein referred to; in the main I understand them thoroughly.

Q. 7. State whether or not you find in any of those exhibits, from four to twenty, inclusive, a description of the invention or discovery set forth in the patent in suit; please answer in detail as to each exhibit, giving your reasons for such opinions as you may express.

(Objected to.)

A. I do not find described in either, any, or all of said exhibits, numbered from four to twenty, inclusive, any description of a well which, in its process, construction, or mode of operation, anticipates or is like the invention described in the patent in suit.

74 EXHIBIT No. 4,

Being a copy of an English patent granted to John Goode, enrolled October 16th, 1873, describes numerous tools, appliances, and appurtenances for making artesian wells by drilling, boring, and raising the earth and material from the opening thus made, which forms the body of the well, to the surface; the patent being, as stated in the specification, for certain improvements in tools or apparatus for boring the earth for the purpose of obtaining and raising water.

I do not find described in that patent either the process, construction, or mode of operation set forth in the patent in suit; there is no description given of any method of piercing the earth by a simple puncture and forming an opening for the body of the well without removing the earth upwards; there is no description of a process for obtaining water from the wells by a method utilizing the discovery of Col. Green that when a tube which is air-tight from its upper end

down to and into a water stratum has a pump attached to its upper end by an air-tight connection and operated in the usual manner shall, by removing the atmospheric pressure from the body of the well, cause the water in the earth, by the pressure of the atmosphere thereon through the superincumbent earth, to flow directly from the earth into the well at a velocity due to such pressure, and because I find no such description in such patent I say there is nothing therein contained describing a well which in its process, construction, or mode of operation anticipates or is like the invention described in the patent in suit.

75 EXHIBIT No. 5,

An extract from the Repertory of Patented Inventions, published in London in 1827, is in the main a repetition of the specification of the patent of John Goode, as described in the patent in Exhibit No. 4, but appended thereto is the statement that—

"The patentee mentions that tubes, with valves at their ends and containing pistons like figure 5, moved by a cord, may be used for drawing it (the water) up, but it is evident that the use of these could be only temporary, as without pipes of some kind the hole would soon fill up, and when pipes were used it is obvious that they might be made to act as a pump by being furnished with pistons and valves."

Nothing contained in this exhibit changes the opinion I have given in regard to the Goode patent, or shows it to be in any respect like the description given in the patent in suit.

EXHIBIT No. 6

Is an extract from the Dictionary of Arts, Manufactures, and Mines, by Andrew Ure, published in New York city in 1847 by D. Appleton & Co., at page 63, under the heading "Artesian wells."

This is mainly in reference to the patent of John Goode, as set forth in Exhibits Nos. 4 and 5, coupled with the remark that "In the process of boring there does not appear to be anything new proposed, but that these several tools are to be employed for boring, packing, and otherwise penetrating and raising the earth and extracting broken or injured tools."

"There are also suggestions for employing long buckets; also lift pumps, with a succession of buckets, but as these suggestions possess little, if any, novelty it cannot be intended to claim them as part of the patent."

76 Nothing contained in this extract in any way changes the opinions I have given, with the reasons therefor, that the invention set forth in the patent in suit is not described or anticipated by anything contained herein.

DEF'T'S EXHIBIT No. 7

Is an extract from page 388 from McKenzie's 5,000 Receipts—article "To raise water in all situations."

There is not in that extract any description by the following of which a man could make any kind of a well, and nothing contained in it describes, refers to, or even suggests such a well as is set forth in the specification in the patent in suit. And as further reasons for saying that it does not describe such a well are the facts that the same extract was set up in the cause of Andrews *vs.* Carman, and also in the cause of Hine & Stephenson *vs.* Wahl, and by the decisions in those causes judicially declared not to contain an anticipatory description of Green's invention.

DEF'T'S EXHIBIT No. 8

Is an extract from Rees' Encyclopædia, vol. 40, Philadelphia, 1819, published by Samuel D Bradford, under the heading "Well in Rural Economy."

The statement therein contained is that "a French philosopher proposed that the ground should be perforated by means of an auger or borer, a cylindrical wooden pipe being then placed in the hole and driven down by a mallet and the boring continued, that the pipe may be forced down to a greater depth." * * *

"In proportion as the borer becomes filled with earth it should be drawn up and cleared." * * *

77 "The boring may be carried to much extent under ground."

This statement was in evidence in the cause of Hine & Stephenson *v.* Wahl, and was decided not to anticipate Green's invention, nor is there anything in the article describing any portion of the invention as set forth in the patent in suit.

DEF'T'S EXHIBIT No. 9.

Extract from the Journal of the Franklin Institute, third series, published in 1844, from vol. 12, page 128.

This extract contains no description of any well of any kind; it merely states that in sinking a well at the Portsmouth dockyard one of the principal docks gave way in consequence, and the sinking of the well was abandoned.

DEF'T'S EXHIBIT No. 10

Is an extract from "Brand's Encyclopædia or Dictionary of Science, Literature, and Art," Harper Bros., New York, 1843, vol. 3, page 1333, under the heading "Artesian well."

No description of any well appears in this extract. The reference is as follows: "All that is necessary, therefore, is to bore down to the stratum containing the water, and, having completed the bore, to insert a pipe, which may be either left to overflow into a cistern or it may terminate in a pump.

I found, on consulting the dictionary, between the words "pipe"

and "which" the words "into the bore." I also found in addition to the extract, and following it, a statement that when the water would not rise to the surface a well may be sunk to a certain
78 depth, the auger hole made, and the pipe inserted into it at the bottom of the well (and from the bottom of the well); it may be pumped to the surface by any of the usual modes, and continues with the statement that at Chelsea, in 1793, a well was dug 394 feet within 20 or 30 feet of the river Thames; that usually they bored 10, 15, or 20 feet below the bottom of the well, and at the last boring that the water rose rapidly 200 feet, scarcely allowing the digger time to withdraw the borer and tools and be drawn up. The article, further continuing, speaks of the process of boring used by Mr. Goode, who put down successful wells at Tottenham and Mitcham, both of which at one time equalled 8 gallons per minute, but had been much reduced on account of the great number of holes.

These latter statements go to show that the artesian well making, at the date of that publication, 1843, still followed the method of boring as long previously practiced, and states "that the process of boring the earth for spring water has lately been practiced with great success by Mr. Goode."

For these reasons it is evident to my mind that nothing at that date had been known or published describing the method invented and patented by Col. Green.

DEF'T'S EXHIBIT No. 11

Is an extract from Rees' Cyclopædia purporting to be from vol. 35, under the heading "Spring draining pump."

Speaks of a pump constructed of copper "in the pipe form, in a very neat, *simple*, cheap, and simple manner, so as to admit of being put down into the ground in holes formed by the boring auger, and, being made to be wrought as a pump, is capable of showing
79 the presence of water where the pressure of it in the higher grounds above is not sufficient to force it up through the auger holes, which is the case in many instances."

This description does not give or set forth any of the characteristics of a driven well, either in its method of making, mode of operation, or results. It is a mere placing of a pump in an auger hole to ascertain the presence of water. It does not describe a pipe tightly inserted into the earth and receiving water directly from the earth by the pressure of the atmosphere forcing it into the well, which had been previously relieved from the pressure of the atmosphere, nor was it used as a well. The entire description leads me to believe that the pump, with its copper tube, was inserted into a well hole of considerably larger diameter, leaving the pressure of the atmosphere to act directly upon the surface of the water in the well surrounding the pump-pipe; but the description is not such as would enable any person to do the same thing in the same manner without further instructions. This extract was set up by defendants in the

cause of Andrews *et al. vs.* Carman and Hine & Stephenson *vs.* Wahl, and in those cases decided not to have been an anticipation of the invention of Green, as set forth in the patent in suit.

DEF'T'S EXHIBIT No. 12.

Extract from the London Encyclopædia, London, 1829, vol. 22, page 593, headed "Well tube."

An hydraulic instrument for procuring water in almost any situation, suggested by M. Cadet de Vaux.

"He directs the tube to be placed in the hole and driven down with a mallet, after which the boring must be continued that a pipe may be driven to a greater depth. As the auger becomes filled
80 with earth it ought to be drawn up and emptied. * * *

"The boring is carried to a considerable extent underground, and water is in most instances obtained. * * *

"This plan of boring for water has of late been much practiced in the neighborhood of London."

This is not such a description of a method of making and operating a well as would enable any person, by simply following the instructions contained in the article, to make a well, but with the knowledge I have obtained from the extracts here offered as exhibits and other matter from the same works, and from other publications relating to well-making, it is plain to me how the author intended parties to proceed, and that the method he proposes is in its main and important features, and intended to be the same, as the plan that had then of late been much practiced in the neighborhood of London, to wit:

Sinking a well by driving down a tube, boring or drilling out the earth and rock, and bringing it to the surface, with such or similar tools as are described in Goode's patent.

DEF'T'S EXHIBIT No. 13.

An extract from the Mechanics' Magazine, London, 1824, vol. 2, pages 15 and 16, under the heading "Boring wells."

This extract is a copy of a letter from a well-sinker, stating his difficulties, and asking for information as to how he can overcome overcome them; also an extract from the same work, vol. 2, page 60, being an answer to a well-sinker's inquiry as to how he should overcome his difficulty, and signed "T. T.," and advises the driving down of a cast-iron pipe, the use of boring rods, and the shell borer to bring out gravel that gets into the pipe.

81 Nothing contained in this exhibit has any relation to such a well as described by Col. Green in the patent in suit, and, in fact, is nothing more than a suggestion to a party in the business how to proceed under certain emergencies, and is not such a description as would enable any person, by following it alone, to make a successful well, much less a well constructed as or operating in the manner of the well described in letters patent in suit.

DEF'T'S EXHIBIT No. 14.

Extract from Harpers' New Monthly Magazine, September, 1851, page 640, Harper Bros., New York.

Nothing is herein contained, except by inference, as to a well of any kind. It says:

"After going as deep as the gravel or quicksand in which the first vein of water is found will permit, and reaming out the hole, the log is inserted, having its lower end sharpened and defended by a tapering iron band well secured. This may be driven down without much trouble through the bed of quicksand, and a passage is thus secured to the rock."

This description of the log, so far as it goes, gives the general method in use for sharpening logs as at that time used for making artesian wells—that is, by surrounding the bottom end with an iron band tapering to an edge at the bottom. It is at best but a very imperfect description even of that, and can only be understood when read in connection with other exhibits in this cause and other articles upon the subject of artesian well-boring.

82 DEF'T'S EXHIBIT No. 15

Is an extract in the French language from "De l'Art du Fontenier Sondeur et des Puits Artesiens," Paris, 1882, page 99, secs. 79 and 80, page 106, sec. 88; also pages 107 and 108, sec. 91, pages 109 to 112, and page 113, sec. 95, with translations into English furnished by defendant.

These extracts also relate to the making of the long well-known open artesian well. They do not contain such a description of well making as if followed exactly would enable a party to make a successful well of any kind; but in connection with the information upon the subject contained in this and other extracts filed as exhibits in this cause, and from information derived from other works upon the subject, I am enabled to form a pretty accurate opinion as to what style of wells and their method of making is referred to. The boxes referred to are undoubtedly square wooden boxes with their lower ends sharpened and protected by an iron band brought to an edge at its lower extremity, which boxes are driven down through the loose earth and quicksand, which are taken out from and through them (the boxes) as they are sunk into the earth, their use being to keep the sand and loose earth from falling into the opening into which the buses are to be inserted, these buses or pipes of wood being guarded at their lower ends by iron bands made sharp upon their lower edge, like the bands upon the lower ends of the wooden boxes, as is distinctly stated in the translation, although this iron guard upon the end of the pipe, which in the original French is termed a *sabot*, is in the translation rendered a point, the literal definition being a shoe; but, whether a shoe or a point, the statement from page 109 is that the tubes are put into the calcareous strata which is previously bored a diameter of 7 inches, in order that

they can enter therein only by means of hard forcing, the wooden tubes having been previously described in section 80 as
83 being of seven inches exterior diameter, their exterior diameter being seven inches, and the diameter of the bore, as on page 109, being 7 inches in diameter, making a tight fit, the object evidently being to prevent the upper stratum of water passing down between the wooden tube and the calcareous stone or earth surrounding it, thus preventing any water passing up thrugh the tube, except the water in the stratum below the calcareous. That the wooden tubes are protected by an iron ring or shoe instead of having a point is evident from the fact that with a point there would be no means of ingress for the water into the tube, as no provision is made, suggested, or hinted at for the entrance of water into the tubes except through their open lower end. If, however, such provision were made for entrance of water through the points into the tubes, still, as it is distinctly stated that the hole is drilled previously to the tubes being put in, whether they are protected by a shoe or a point, they are not driven to form a well without the removal of earth upwards, so that it is totally immaterial whether the drilling takes place through the open-ended tube or is first done before the tube is inserted. Therefore, from this description, it is evident that in their methods of construction the wells referred to in Exhibit 15 are not made in the manner set forth in the specification of the patent in suit. The article from section 94 which closes with the statement that if the waters do not rise inside of them to be poured out on the surface of the ground, but remain stationary a few meters below, then "there is used, in order to draw them up, pumps like those which are constructed in every country." Nothing in this statement regarding the use of pumps shows, suggests, or hints at the employment of Green's method of obtaining water from the earth or in any manner utilizing his discovery; nothing is described other than the old well-known and often-described methods of procuring water from the earth by the artesian process, the water
84 either flowing over the top of the well, or, in default of its rising high enough to flow, it is pumped from the well by a pump having its suction pipe inserted down into the well, and not connected thereto by an air-tight connection. I have omitted to to notice that portion of the article, page 113, section 95, which is merely a statement that sometimes, after a number of years, the volume of water from wells established according to the principles and processes described diminishes, and gives a method of operation by which, by the stroke of a piston, the calcareous parts which stop the fissures through which the water bursts are forced to ascend to the surface of the ground, but nothing therein contained refers to anything described in letters patent in suit.

DEF'T'S EXHIBIT NO. 16.

Extract from "Bulletin de Musee de l'Industrie, 1846, vol. 10, page 163." Translation.

Contains no description of a well of any kind or the method by

which water is obtained from the earth by one. It speaks, however, of boring a well, and to [the] depth of 1,000 meters (some 3,250 feet), this last statement of fact being of itself alone sufficient to show that the well was of an entirely different character from the well described in the letters patent in suit. And further it says: I have brought up by this means pebbles of six centimeters in length and three centimeters in thickness, a state of facts which could not exist in the operation of a well made in accordance with the specification of the letters patent in suit.

85 DEF'T'S EXHIBIT No. 17,

Being an extract from "Hericart du Thury Jaillissement des Eaux," Paris, 1829, pages 274 and 275.

Gives a very indistinct and not by any means a full description of making an artesian well by boring and putting down a pile with a bore hole through its entire length of three inches in diameter, furnished with iron at both ends. The one which is to enter the ground should be as sharp as possible. They drive this pile with the beetle as far as possible, and when there is no means of making it enter any further they employ the auger, which should finish the boring of the well.

This discription, such as it is, occurs in a discourse by the author, which is at the end of "My course of mathematics." It is not such a description as by which, without further information, any man could make a well, and contains nothing which can be construed into a struction of a driven well made according to the specification of the letters patent in suit, but so far as it goes is in perfect accord with other numerous descriptions of the making of artesian wells by boring, drilling, &c., and raising the earth displaced by the tubes to the surface.

DEF'T'S EXHIBIT No. 18.

An extract from F. Arago Œuvres, tome 6, page 457, Paris and Leipsic, 1856. Translation furnished by defendant; appears to be an addenda to an article in which some system has been described, and speaks of an injection of the watér that takes place through the inside of the boring apparatus, and says:

"The idea of causing the water to come up through the inside of the pipe of the well offers an easy means of boring below a sheet of rushing water without having need of a pump." * * *

86 "It will drag to it and bring to the surface of the ground all the detritus."

Nothing herein contained has reference to the methods of making driven wells; but, so far as it goes, it describes a method directly and entirely antagonistic to the method of procuring water as by the specification of the letters patent in suit.

DEF'T'S EXHIBIT No. 19.

Extract from a work of F. Garnier, "Traite sur les Puits Arte-

siens," Paris, 1826, pages 207, 208, 210–227, and 228. Translation furnished by defendant.

Contains a repetition of the method of opening seams to admit of the passage of water into the well, the fissure having been narrowed by calcareous parts, which are interpolated there; practically the same operation as described in Exhibit No. 15, which is by the same author.

In the plates which accompany this article in the original French the logs which line the well are shown with open ends, and are undoubtedly of the same character as the pipes or buses which are described in the article Exhibit No. 15. It goes on to state; "We have performed these operations on a well made since the year 1810, in a piece of ground of which figure 4, plate 2, presents the vertical section, and we have found * * * that the volume of water produced was * * * 21 cubic metres per hour, whilst it was before this operation only 15 cubic metres."

The purport of this entire article, as well as the article, Exhibit No. 15, by the same author, goes to show that the water obtained by these wells was procured not from the earth, but from fissures in the rock, and that the water flowed from the wells.

Figure 4, plate 2, referred to in the quotation above in the original work, shows a tube open at both ends and no pump of any
87 kind operated with it. That portion of the extract from pages 227 and 228 speaks of "cast-iron pipes, about which we have just been occupied," evidently referring to a description preceding the extract, and says that by means of a single pipe to restrain the sands which are met one succeeds almost always, even when the thickness of the sands exceed 100 feet.

"When these sands are perfectly supported they proceed then with the boring into the midst of the clays, giving to it, until they have reached the chalky limestone, a diameter of four inches; * * * that the beds of sand are passed more quickly by using cylinders of cast-iron than with boxes of wood, and that because the ground need not be bored to so great diameter." * * * "One should nevertheless employ the English process only when it is a question of placing wells in grounds which present, in order to be passed through, great difficulties, and which require the use of three or four boxes, because the expense then is very nearly the same in both cases."

These boxes are driven down one inside another, each succeeding being smaller than the one preceding, and not being one continuous box or square tube, and their use is positive proof that the process of well-making, as described in the article, had no likeness or analogy to the process described in the letters patent in suit, and the method of procuring water does not utilize the discovery of Col. Green, and nothing is described, suggested, or even hinted at which involves his method of construction or operation or utilizes his discovery. Every portion of the description relates to an entirely different mode and method.

88 DEF'T'S EXHIBIT No. 20.

Extract from the Encyclopædia of Domestic Economy, Harper Bros., New York, 1849.

This extract is a description of an ordinary suction pump and its working. The figure connected with the article in the work itself is a cut showing a suction pump with its suction pipe inserted into an open well. No description is given of the well or its manner of making, but the cut speaks for itself. There is nothing relating to a driven well, an artesian, or any other well; it is simply and only a description of such a suction pump as has been in use as long as I can remember, and nothing in the article or in the cut annexed has any relation to or connection with a driven well, and in fact, except as shown in the cut, there is no reference to a well of any kind, if indeed the cut represents anything more than a tank of water, into which *the* water, as the article states, the suction pipe is plunged.

FRIDAY, *April 14th*, 1882—4 p. m.

Adjourned till Saturday, April 15th, 1882, at 11 o'clock a. m.

SATURDAY, *April 15th*, 1882—11 o'clock a. m.

Parties met pursuant to adjournment.

Present: Charles S. Hamilton, Esq., on the part of defendant, and William D. Andrews for complainants.

Examination of WILLIAM D. ANDREWS continued:

By Mr. ANDREWS:

Q. What do you understand to be the invention or discovery set forth in the patent in suit? Give your reasons in detail with reference to the decisions heretofore made by Judges Benedict and Blatchford.

(Objected to.)

89 A. I understand the invention to be founded upon the discovery by Col. Green that if a pipe which is air-tight throughout its length, except at its upper end and at or near its lower end, where are openings for the admission of water, be inserted into the earth, down and into a water-bearing stratum, the pipe within the water-bearing stratum being surrounded and in close contact with the earth, and having a pump of any ordinary construction attached by an air-tight connection to its upper end, thus forming a well, air-tight from its upper end, into and below the surface of the water in the earth, that upon operating the pump so attached and removing the pressure of the atmosphere from the well *that* the pressure of the atmosphere through the earth upon the surface of the water within the earth would force the water into the body of the well with a velocity due to the pressure of the atmosphere, and that the supply of the water to the well directly from the earth surrounding it would be continuous and lasting, so long as water was contained

in the stratum of earth with which the lower end of the pipe was in communication, and that the water contained in that stratum could be made directly tributary to the well without regard to the distance to which said water-bearing stratum might extend. In other words, that unlike the previously-known open wells, either dug or bored, into which the water from the surrounding earth was forced by the action of gravity alone, that he could control the delivery of water to a well by this pressure of the atmosphere, which he discovered acted as effectually through the earth to force water from the earth into a well from which the pressure of the atmosphere had been removed as if no earth existed above the surface of the water.

To utilize this discovery he proposed a method of making a well by simply driving a tube down through the earth into a water-bearing stratum, by which means he secured a close contact of the lower end of his tube with the earth of the water-bearing
90 stratum. My understanding of the invention is that having made the discovery, as I have explained, and having invented a new method of making a well to utilize that discovery, that he was entitled to the exclusive use of that method of making a well, and also to the use of any other method of utilizing his discovery, which was substantially the same in effect, and not the private property of another, and that having thus described a method of procuring water from the earth, which utilizes that discovery, that he is entitled to the exclusive use of the process or its substantial equivalent in the mode of construction and mode of operation. In giving my understanding of the invention I have reference to the patent itself, to the evidence which has heretofore been offered in relation to the invention, and to the decisions of the judges thereon.

Q. 9. Have you any other reasons than these you have given in detail in relation to the several exhibits, Nos. 4 to 20, inclusive, why you do not believe that either the authors of any of the works from which the extracts were taken or John Goode, the patentee, whose patent is set forth in Exhibit 4, or any other manufacturer of artesian wells ever conceived the idea or practiced the method of procuring water from the earth as set forth in the patent of Col. Green, for infringement of which this suit is brought? If so, please give them.

(Objected to.)

A. I have many reasons for believing that the method patented by Col. Green never was known or used previous to his discovery and invention. Among those reasons is the fact that during the course of the driven well litigation, now extending over ten years, the counsel for different defendants have set up numerous publications and letters patent in the English, French, and German languages, describing the methods in use in those countries for making wells and obtaining water
91 from the earth, which publications and patents in the English language I have carefully read, together with trans-

lations from those in the French and German languages, and in addition thereto all works upon wells and well-making with which I have become acquainted after diligent inquiry, and in none of those works have I found described or even suggested the methods of making a well or of procuring water from the earth as set forth and practiced by the method of Col. Green; and in addition to information thus sought I have read many articles of a date since Green's invention, from English scientific and other works, in which the American driven well is treated of always as an American invention of recent date, and by parties whose learning, standing, and several professions warrant the belief that they were thoroughly conversant with the methods of obtaining water previously in use.

Among these publications I will mention a few and quote therefrom.

(Quotations objected to by defendant's counsel.)

In the London Mechanics' Magazine of Dec. 13th, 1869, page 389, is a long article headed "The American Tube Well," from which I give extracts.

It says: "Probably no invention of the present day is causing among scientific men so much attention as is this exceedingly simple and yet most efficient apparatus for obtaining in almost all situations pure water at a small outlay. * * * It is evident that, apart from the simplicity of the tube-well system, its great advantage is in the purity of the water obtained. * * * It is very questionable if in any case an open well is more than a cesspool in which the drainage from all the surrounding soil is collected. The unhealthy character of many localities may be fairly traced to the deleterious nature of the water supply arising from
92 this cause, and it must always be a matter of vital importance to obtain water cut off from these impurities, and, if possible, drawn directly from the natural source.

This the patent tube-well most completely effects, for the tube driven into the ground seals up the well from all surface drainage. * * * It has already been adopted by all those who value the purity of water. * * *

The government, after testing it practically at Aldershot, have sent a special brigade and a number of wells with the Abyssinian expedition. The Emperor of the French has had several wells sunk under his own supervision, with most decided success, both at Buchy and near Paris, and has ordered a number for the army and school of agriculture.

From a long article in the Illustrated London News of March 21, 1868:

"Some interesting experiments were made on Saturday with the patent tube-well adopted by the Royal Engineers for a ready supply of water to the British troops in Abyssinia. It is an American invention. * * * In this country it was first exhibited at Manchester. * * *

The tube, one and one-quarter inches in diameter, was driven into the ground some 15 or 16 feet, and, the pumping apparatus being affixed, water was produced at the rate of 10 to 12 gallons per minute in 19 minutes from the commencement of the operation."

From the London Mechanics' Magazine of March 20, 1868:

From a long article on these wells I quote: "The invention in question is generally known as the American tube-well, and it has earned a substantial reputation from its successful working in the Abyssinian operations. * * *

"Instances have been met with in which large sums of money have been spent in attempting to sink curbs or rings in quicksand to form a well and have failed, where on the patent tube plan the most successful results have followed."

93 The United Service Magazine, London, 1867, part I, page 127, says:

"Now, what are the prospects of the Abyssinian expedition? There is said to be the greatest scarcity of water."

In part II, page 566, it says: "The well sinkers directed by Lieut. Mersurier have rendered excellent service."

In relation to experimental trials of the patent American tube well several reports were made by secretaries of the British war and military India officers, officers of engineers, &c., which appear in the parliamentary reports, copies of which I have read in the Astor library; also reports to Parliament, enclosure No. 578 being selections from despatches of Sir Robert Napier.

Page 39, enclosure 6: Report of Daniel Clair Williams, R. E., lieut.-colonel commanding engineers, Abyssinian force, No. 1, water supply. I give extracts:

"Lieut. Le Mersurier, assistant field engineer, came out from England expressly to set up the new American driven wells and pumps at different points. * * * Beyond Antalo four of Norton's tubes and driving apparatus complete were carried on six mules as far as Lat."

Norton was the English patentee, but was not the inventor, the English patent laws not requiring the patentee to be the inventor, and in the application for the patent——

(Defendant's counsel objects to contents of application.)

it is stated to be a communication from abroad.

I quote further: "They were then of necessity left behind, and finally reached Magdala on the eve of our departure, enabling us, however, to obtain a supply of pure drinking water after a want of it for 60 hours.

94 Then follows a table giving the date and permanent locations of some thirty of these tube wells at various places on the line of march.

From selections from dispatches of Sir Robert Napier:

"Well Sinkers."

From page 182:

"At the encamping grounds, where the water was liable to be fouled, owing to the scanty supply, pumps were driven to afford drinking water to the force, and drawn again the next morning previous to marching."

From Harpers' Magazine, August, 1868, page 348—article, "Abyssinia"—a reference is made to driven wells. I quote:

"It was a picturesque campaign, this of Gen. Napier in Abyssinia, in which, said the Spectator, a passage of the Alps is a daily incident, in which the organization of the army, though not its courage, has been tested to the utmost; in which they are employing and harmonizing the military systems of two empires and two ages; of the east and the west, of Count Von Moltke and Pyrrhus, laying down railways with the help of camels, carrying the newest devices in scientific gunnery upon elephants, using theodolites to clear the way for bearded old Musselmen sabreurs, and compelling a lofty African desert to yield water by an American device not yet a twelve-month old."

In the Metal Worker, a weekly paper published in the city of New York, No. 107, January 19, 1878, there is copied from the London Engineer, a well-known English scientific publication, a paper read by Mr. Leo Grand before a meeting of the society of engineers in London, which gives a condensed history of the driven well in England and methods of making it, from which I quote:

"It is now a little over 10 years since tubes were introduced into this country. The first notice came from America. Public trials of its usefulness were made in London, Manchester, and elsewhere; and as the government was at that time preparing its
95 expeditionary force for Abyssinia, the war office authorities had their attention drawn to this invention, and with unusual alacrity they ordered trials to be made at Chatham. These trials so satisfied the commander of the royal engineers that he forthwith recommended the authorities to adopt tube wells as part of the equipment of engineers, and they continue to form an integral part of such equipment to the present day. * * *

"The smallest size wells are advantageous for manufacturing purposes, for supplying moderate-sized boilers with feed-water, not only in rural districts, but in towns supplied by water works, thus saving heavy water rates. Many are thus used, even in the heart of London. * * *

"In fact tube wells must daily become more and more an indispensable adjunct to the plant of engineers and others dealing with land projects generally, and the only wonder is that such a very simple invention should not have seen the light many years sooner than it did."

In the Metal Worker of January 5th, 1878, is published an article on tube wells for large supplies, being a paper read by Mr. Robert Sutcliff before the English Society of Engineers. I give extracts:

"In laying down plant for obtaining large supplies of water a number of tube wells were coupled together by horizontal mains, so that one pumping engine drew from many tubes. * * *

"At Burton-on-Trent, * * * Allsop & Sons pump six hundred thousand gallons daily from 30 three-inch wells; * * * Bass & Co., 500,000 gallons from 25 tubes. Thus, in one town, breweries are obtaining sufficient water for a town of 40,000 inhabitants. * * * The mode of pumping and development of supply was entirely peculiar to the tube-well system. * * * It is possible that coupled tube wells in the chalk may solve the problem of supplying London with pure water."

These quotations from scientific works and papers read be-
96 fore the scientific societies of London show that the officers of the British army and navy, men of scientific attainments, who, as a body, keep abreast with all the improvements of the day, did, in 1867, while fully knowing, describing, and using tube wells in a manner set forth in Green's patent, treat and consider them as of then recent invention, and accredited the invention to America. The extracts from the papers read before the Society of London Engineers and the English Society of Engineers, societies composed of the most learned and scientific men in England, whose calling leads them especially to acquaintance with water supplies of all kinds, and the history of wells and well-making show that after ten years of use of the invention, which, in 1867 was by the army and navy officers accredited as an American invention, these men still accredited it as an American invention, and no publication made since the invention by Col. Green has been produced in which any claim is set up that the invention had been previously made either in England or elsewhere in Europe, and this in connection with the fact that John Goode's celebrated patent had been previously used in England for nearly forty years previous to the invention by Col. Green, added to the fact that Brande's Dictionary, in the same article quoted from and herein offered by defendant as "Exhibit No. 10," in speaking of Goode's wells, says that the process of boring the earth by Mr. Goode had been practised with great success, and cites in proof of it that at Tottenham and Mitchem he made two wells, both of which at one time gave a supply of 8 gallons of water per minute, but which had been much reduced on account of the great number of holes. When this statement is contrasted with that of Mr. Robert Sutcliff in the paper read by him before the English Society of Engineers, in which he says that Allsopp & Sons had for nine years procured 600,000 gallons of water daily from 30 three-inch wells, an average of 13 gallons per minute for the entire 30 wells all connected together (and necessarily
97 near together), it will at once be seen that the method of procuring water from the earth by the driven-well system is radically different from the methods previously practiced in England.

These facts corroborate the correctness of the shown to be generally received opinion of the army and navy officers and scientific men of England, as expressed at the time of its introduction there. In addition to these statements Stephen Brewer, one of the parties who introduced the driven well patent into England, and who was present at the experiments made by the English officers previous to the adoption of the driven well system by the English army for use in the Abyssinian expedition, who has been repeatedly examined as a witness in causes arising under the patent set up in this suit (being first called as a witness by one of the defendants), has given a statement (defendant's counsel objects to witness stating what Stephen Brewer has testified to or stated) corroborating what has been quoted in regard to the experimenting with the driven well by the English army officers, and by the Emperor of the French at St. Cloud, near Paris, France. He testifies to having made many wells in the neighborhood of London which, with the exception of wells at Manchester, about 100 miles north of London, and at Chatham, about 80 miles from London, all were made within a radius of 30 miles around London, and that the people looked upon it as a new method and generally marvelled that so full a supply of water could be obtained in so simple a manner. He states that at Aldershot there were a good many persons present—a good many officers of the station; the same is true of Chatham; a good many persons were present of the marines, and that at near Windsor the Queen's plumber came over and saw us put down a well. At Hackney, by special invitation, several of the leading firms of London,
98 who dealt in pumps and other well gear, were present and witnessed the operation. We took up a well and it down again in their presence, and obtained clear water, all in the space of one hour; all seemed to regard it as a new thing. I did not see, hear, or read of any such well ever having been in existence in England.'

James L. Norton was made our agent for the introduction of the well into the country generally, and subsequently we sold him the patent.

(This Norton is the man in whose name the English patent was taken out.)

The foregoing quotations from the various works and from the testimony of the witness Brewer I have given as further reasons why I have stated that I believed none of the exhibits set up by defendant contained any descriptions of or suggestions leading to the use of the method of procuring the water from the earth in the manner and by the methods as per the specifications of the letters patent in suit, in addition to the fact that I can find nothing in any of the exhibits describing or suggesting such a method or process, nor anything even that in the present improved method of the art of well-making can be construed into a description or suggestion of Green's method or process.

Q. 10. Have you read Defendant's Exhibit No. 2, being a copy of

United States letters patent granted to James Suggett, March 29, 1864, and numbered 42126; do you understand that patent; and, if you say you have and do, will you please state whether you find anything in that patent conflicting with the patent in suit, and give your reasons?

A. I have read the patent of James Suggett and understand it. The patent is for a perforated pipe with a pointed end, constructed as a drill, and united with a pump, being a patent for an implement, and not for a process, and could not be used for the
99 making of a driven well without infringing upon the patent in suit; nor could the patentee, Green, use the patent of Suggett in a well to operate by his process without the permission of the patentee, Suggett, provided the patent was a valid one, but having been declared invalid in the only suit brought to my knowledge, in the cause of Hazelton *vs.* Ogden, in the Ohio circuit, is now and long has been, as I understand, open and free to the use of the public, it having been shown in the case cited that the same instrument had been previously made and used, and the claimed invention was held to be for the implement only, the previous making of which anticipated the invention by Suggett.

Cross-examination by Mr. HAMILTON:

X Q. 1. How many kinds of wells are there?

A. In general terms, there are three kinds.

X Q. 2. Name them.

A. Open dug wells, walled, boarded, or otherwise lined; artesian wells, drilled and bored and usually lined, except in rock strata, and driven wells, as set forth in the specifications of the letters patent in suit.

X Q. 3. How is a bored well made?

A. Made by the use of drills, chisels, augers, and a great variety of auxiliary tools, by which an opening is made into earth down to water and the material displaced taken to the surface. It is usual in making artesian bored wells to drive down a wooden or iron pipe open at both ends, having a sharp edge around the circumference of its lower extremity, which pipe is usually driven to rock, the earth being taken out from within it. As the driving proceeds, and after it reaches the rock, chisels, drills, &c., are used to disintegrate the rock, which is taken to the surface through the tube so driven.

X Q. 4. Are they sometimes made by boring with an auger
100 or other instrument down to the water, and then the tube driven down from the surface of the ground?

A. The accounts of making artesian wells show that in some instances boxes are driven down in lieu of the tubes, but they are in effect themselves tubes, but are not the tubes through which the water rises to the surface of the ground, a tube of some kind being a necessity, to prevent the caving in of the sides of the opening.

X Q. 5. Is the tube always a necessity where the boring does not terminate in rock or some hard substance?

A. It is, including clay or like material.

X Q. 6. Is the boring in some cases carried as far as desired before

the tube you have mentioned as necessary is inserted or driven down?

A. Not to my knowledge, the use of the tube being to keep back the earth. Unless the walls of the excavation were of rock, hard clay, or similar materials, the boring could not be made to water without the sides being in some way supported, and it is usual, if not invariably, the custom to drive down open-ended pipe to the rock as a commencement.

X Q. 7. When this is done is this pipe allowed to remain as a lining for the well?

A. Usually it is; in former times it appears not always to have been. I have reference now to the boxes described which are in reality tubes in a square form.

X Q. 8. In your direct examination you speak, in reference to the defendant's exhibits, of boring, and emphasize that expression; does it (boring) necessarily in all cases mean a removal of earth upwards?

A. It does in all the cases I have read

X Q. 9. Then if you hear or read of boring you necessarily understand, do you, that the earth in the process was removed upwards?

A. Yes; if the word is used in its proper sense.

X Q. 10. If a tube is driven into a hole in the ground, made
101 by boring, and a pump screwed or soldered to the top, do you claim that to be an infringement of the patent in suit?

A. Confined to just what is stated in the question I claim it would not be an infringement.

X Q. 11. If you drive a tube into the ground, having its lower extremity pointed and perforations in the sides, and attach a pump to the top by screwing on or soldering, and commence pumping, what do you draw through the pump besides water when you first commence?

A. That depends upon the soil you are in; usually a small amount of mud or sand, as the case may be.

X Q. 12. Does that sand or mud come from immediately around the perforations of the tube, and, if so, does it finally make an open space in the earth around these perforations?

A. That sand or mud comes from a greater or less distance outside the tube and does not make an open space, in the general acceptation of the term, around the perforations, but it does make spaces between the coarser particles around the tube, leaving interstices between them similar to what would occur if a barrel should be filled with bullets and fine shot, filling the spaces between the bullets, which fine shot being removed would leave not an open space, but interstices between the bullets, the barrel being full of bullets whether the shot were present or not.

X Q. 13. If a tube were driven into the ground and the water rise therein until it overflow, do you claim that to be an infringement of the patent in suit?

A. I do, provided——

(All but "I do" objected to by def't's counsel)

provided the tube be driven into the ground and the earth displaced laterally without removing it upward.

X Q. 14. You speak in your direct examination of the at-
102 mosphere pressing on the water-bearing stratum of the earth into which a pipe is inserted to make the kind of well claimed to be covered by the patent in suit. Is that pressure always the same?

A. Virtually it is; in practice it varies somewhat.

X Q. 15. How deep do you sometimes put down the well pipes you have mentioned in your direct examination as having used in the construction of the wells under the patent in suit?

A. Sometimes as deep as 120 feet.

X Q. 16. In such cases do they often penetrate beds or strata of hard material, so hard that the pipes can be driven only with difficulty, and but little at a blow?

A. That is the case where we drive deeply, when the friction of clay or other hard beds of so great a depth requires very hard driving to overcome.

X Q. 17. Are those beds sometimes hard to penetrate?

A. Seldom, except where there is considerable thickness; the first entering of them is not very hard, but when they extend to a considerable depth the friction upon the pipes (especially in clay, which seems to have elasticity and to close upon the pipe) is such that the farther we go in such material the greater the friction and the harder the driving, and this also occurs when driving to great depths to a more limited extent, even in sand.

X Q. 18. Have you any knowledge of pneumatics?

A. My knowledge is entirely practical, except what is obtained from elementary works.

X Q. 19. If two interstices through or in a body are of the same size, but one crooked and the other straight, through which of these, under the same pressure, will water or air move the faster?

A. Through the straight one.

X Q. 20. Through which if one be longer than the other, but both of the same degree or proportion of crookedness?

A. It will move faster through the short one.

X Q. 21. If you take a wooden pipe, say 10 feet long, with
103 an inner diameter of 3 inches and outer diameter of 7 inches, and drive it into the ground, is any of the earth removed laterally in so doing?

A. That depends entirely upon the shape of the bottom end.

X Q. 22. I suppose the bottom end to be open but chamfered off on the outside?

A. A tube made as described in the last question, if driven, would necessarily displace a portion of the earth laterally.

X Q. 23. Would the same be true of an iron or other metallic pipe made in the same way?

A. It would.

X Q. 24. In your direct examination, in giving quotations from certain publications, you read from a pamphlet or small book. What was that?

A. It was a record of my testimony in another case, that of Hine & Stephenson *vs.* Wahl, tried in the Indiana circuit.

X Q. 25. From anything else?

A. From testimony given in the case of Andrews *et al. vs.* Cross, tried in the northern district of New York.

X Q. 26. Did you ever construct a well by driving down into the earth a pointed tube with another tube the same length, attached to it laterally and parallel thereto, but the latter of said tubes open at both ends and the pump attached to the former or pointed tube?

A. I never did.

X Q. 27. Did you ever see one made and operated?

A. I never did.

X Q. 28. If a tube be made at the lower extremity with the end open, but the outside chamfered off to an edge on the inner side, as described in X Q. No. 22, and driven into the ground so that the water overflow at the top, do you claim that to be an infringement of the patent in suit?

A. I do not.

X Q. 30. What was your business prior to the time you have mentioned in your direct examination?

A. I had been in the iron and metal business and manufacturing machinery of my own invention.

104 4.30 P. M., APRIL 15TH, 1882.

Adjourned till Saturday, April 22d, 1882, at 11 o'clock a. m.

SATURDAY, *April* 22*d*, 1882—11 a. m.

Parties met pursuant to adjournment.

Present: Charles S. Hamilton, Esq., on part of defendant, and Wm. D. Andrews, Esq., on part of complainants.

WILLIAM D. ANDREWS' cross-examination continued:

X Q. 31. In making the wells which you claim are covered by the patent in suit, what is the smallest size in diameter of pipe which you use?

A. I think the smallest size we use in our own practice is a pipe of an inch and a quarter internal diameter.

X Q. 32. Is smaller pipe sometimes used?

A. I believe it is, but very seldom, so far as I know.

X Q. 33. Suppose a pipe, open at both ends, having the lower end chamfered off on the outside to an edge on the inside, be driven into the ground, and what earth there may be in it then removed, and the water rise to the surface and overflow, do you claim that to be an infringement of the patent in suit?

A. I do not.

X Q. 34. Suppose the pipe to be protected at the lower extremity by an iron or steel protection, would it make any difference?

A. I don't understand what kind of a protection is meant.

X Q. 35. I suppose it not to alter the shape of the lower end of the pipe from what has been described in X Q. 33?

A. So long as the shape is not altered it is immaterial how or by what the pipe is protected.

105 X Q. 36. Suppose the water in the pipe just mentioned ceases to overflow, and a pump of the ordinary construction be attached to the top of the pipe, by screwing on or soldering, and the water be raised in that way, instead of overflowing, would that make any difference?

A. A pump attached to the pipe as described by an air-tight connection, and operated in the usual manner, would relieve the inside of the pipe forming the well——

(Objected to as not responsive.)

from the pressure of the atmosphere, and the pressure of the atmosphere on the outside would force the water into the well, thus utilizing the discovery of Col. Green, and would make a decided difference.

X Q. 37. Do you claim that it would be an infringement of the patent in suit?

A. I do.

X Q. 38. Suppose that instead of the pump attached, as in X Q. 36, you use a valve piston worked in the pipe, do you claim that to be an infringement of the patent in suit?

A. Not if the valve piston goes down into the water and raises the water itself without the intervention of a vacuum.

X Q. 39. Suppose that it does not go down into the water, do you then claim it to be?

A. Yes; if it is merely a pump above the surface of the water——

(Objected to as not responsive.)

and draws the water directly from an earth stratum, by removing the pressure of the atmosphere from the body of the well, thereby utilizing the pressure of the atmosphere upon the water in the earth to force it into a well which is air-tight from the valve down into the water stratum of the earth.

106 X Q. 40. In making one of the wells which you claim to be covered by the patent in suit, has the pipe which is driven into the ground any holes in it before it is driven; and, if so, where?

A. The pipes in general use have openings for the admission of water into them near the lower end, usually extending up around the sides of the pipe from 15 inches, sometimes, up to several feet. The wells are sometimes made by first driving down a pointed rod and inserting in the hole thus made a tube open at the lower end, and without the holes in the sides.

X Q. 41. How large are these holes in the sides of the pipes?

A. They vary very materially. Our usual practice is to make holes through the lower part of the pipe, which we technically term a point, about three-eighths of an inch square, over which, upon raised rings, we place a screen of perforated brass, having openings of a size giving from one hundred and fifty to three hundred to the square inch.

X Q. 42. Is the pipe sometimes driven down without this brass screen on the outside?

A. In our practice it is not; by other people, in some soils, it is so used very extensively, as I am informed, and has been testified to in our cases recently.

X Q. 43. What is the largest size of hole you have known to be used in wells made in the way claimed to be covered by the patent in suit?

A. I don't remember ever seeing any above a half inch in diameter made through the sides of a pipe, and seldom holes above a quarter of an inch in diameter, unless covered by some material having smaller openings. Pipes with open ends are used having an opening at the lower end the same size as the pipe, of an inch and a quarter to two inches in diameter in some soils. Our practice is to use the perforated brass covering over openings in the side, as de-
described.

107 X Q. 44. How many holes are usually made in the pipe?

A. According to the size of the pipe; somewhere about a hundred.

X Q. 45. Is the point covered with perforated brass, which you use, larger in diameter than the pipe used for the well?

A. It is.

X Q. 46. How much?

A. Well, about a quarter of an inch on a two-inch pipe.

X Q. 47. How much larger is the largest part of the point than the pipe?

A. The largest swell on the point is about three-quarters of an inch larger than the pipe itself, not quite a quarter of an inch larger than the couplings of the pipe.

X Q. 48. Do you sometimes construct wells with only one joint of pipe?

A. I don't think we ever did, as our joints are never over 6 feet long, and, I believe, we never constructed a well less than fifteen feet deep, and but seldom less than twenty-five.

X Q. 49. Does the water always remain at the same height in one of these wells?

A. So long as the wells are in use they are always full.

X Q. 50. Does the water always stand at the same height in one of these wells when the pump is not being worked?

A. It does, provided the pump is tight.

X Q. 51. What is that height; what is the surface of the water on a level with?

A. The top of the water in the well is on a level with the top of the pipe.

X Q. 52. Suppose a tube with a point such as you use be driven into the ground till it reaches water, and the water do- not overflow at the top, and no pump is attached, does the water always stand at the same height in it?

A. It does not.

108 X Q. 53. With what does it vary?

A. It varies with the height of the water in the earth surrounding it.

X Q. 54. Does the water in the earth around the pipe of one of these wells vary at different times?

A. It does.

X Q. 55. How much—the greatest variation?

A. I am unable to tell you, but near tidewater we have found the variation to be, at times, from half to two-thirds the rise and fall of the tide, and — other situations I think the greatest difference we have noted at any time has been from four to six feet, being virtually the same difference as will be found in open walls.

Redirect examination by Mr. ANDREWS:

R. D. Q. 1. Why do you make the swell to the point of a driven well tube larger in diameter than the tube itself or the coupling to the tube?

A. For the reason that there is a certain elasticity in the soil which, after driving a certain-sized instrument into it, causes the hole to contract after the point passes, and we thus find it necessary to make the point somewhat larger than even the couplings of the pipe, for the purpose of partially relieving it (the pipe) and couplings from the great friction resulting from their passage through the hole thus contracted.

R. D. Q. 2. What is the result of the use of this enlarged point in the water stratum as to keeping the surrounding earth in contact with the point and the tube above it?

A. After reaching a water-bearing stratum of the earth the earth at once settles around the point and tube, even much more rapidly and effectually than it does above the water stratum, and the hole made by driving an instrument into a water-bearing stratum and withdrawing it will remain intact but a very short time, unless said water-bearing stratum is composed of gravel and similar substance, thus leaving the entrance to the pipe in close contact
109 with the earth, and effectually protecting the entrance from the admission of air or free water standing between the pipe and the earth surrounding it.

R. D. Q. 3. What is the practice in regard to the distance to which you drive down the openings in the point below the surface of the water in the earth?

(Objected to.)

A. That depends entirely upon circumstances. If the first stratum of water reached is of a quality satisfactory for use our practice is to drive the tube down until the upper openings in the point are at least six feet beneath the surface of the water; but frequently and usually our practice is to drive very much deeper for the purpose of obtaining purer and cooler water from a lower stratum.

R. D. Q. 4. Why do you always drive until the upper openings, as you say, are at least six feet below the surface of the water?

(Objected to.)

A. First, for the reason that the surface of the water in the earth varies, at times, several feet in height, and we put the upper holes so far below the surface as at all times to keep sufficient water above them to prevent the admission of air; secondly, to avail ourselves of the advantages of the filtration of the water through the earth in its passage to the well, one of the claimed great advantages of this system, and to insure the retention of the water in the earth at all times at a practical level, the water at a distance from the well being forced to move toward it at a velocity in inverse ratio to the square of its distance from the well, by which means the surface of the water in the earth surrounding the well is maintained at the same level. The result is, as I have before stated, that by this means the well is connected directly with and controls the entire body of water contained in the stratum of earth into which the point is inserted.

110 R. D. Q. 5. You have been asked as to the different kinds of wells, and you answered that there were three distinct kinds, to wit, open dug wells, walled or boarded up, artesian bored wells, also open to the atmosphere, usually flowing wells, but from them, when water does not rise to overflow at the surface, it is pumped by inserting a suction pipe into the well and operating it the same as in an open well, and driven wells, which you have explained as being tightly inserted into a water-bearing stratum of the earth, and water forced into them directly from the earth by atmospheric pressure exerted upon the water in the earth surrounding them—will you explain the difference between the operation of these different kinds of wells?

(Objected to on the ground that it does not quote the answer given to the question verbatim.)

A. Water is supplied to open dug wells only by the force of gravity, and when the water is pumped from them by the ordinary suction pump the pressure of the atmosphere is the same on the surface of the water in the well as it is upon the water in the earth surrounding it, and the result is that the water in the well itself, being in free space, is more readily forced by the pressure of the atmosphere into the suction pipe of the pump than the surrounding water, which is retarded by friction through the earth, and in consequence the continued operation of the pump soon exhausts the water in the well, which supply can only be replenished by the action of gravity, the pressure of the atmosphere to retard its flow into the well being equal to and counterbalancing the pressure exerted by the atmosphere upon the surface of the water in the earth, and the operation of the pump has no effect upon the water in the surrounding earth to force it into the well; hence the supply to the open dug well is due to and produced only by the action of gravity.

111 In the artesian well the same principles govern in regard to the means of supply when they are not flowing wells, but in consequence of such wells being usually inserted down into rock or like substance until they meet with open fissures in the rock, through which water flows more freely and readily than it does

through ordinary compacted earth, sand, &c., which form the water-bearing strata above the rock, a much larger quantity of water is obtained therefrom in proportion to their diameter than is usually obtained from the dug well, unless, as in some cases, the dug wells are carried down into a rock stratum and strike a similar seam in the rock. When artesian wells are flowing wells the generally received opinion is (objected to) that their supply of water comes from a water-bearing stratum lying beneath a stratum practically impervious to water, but which lower stratum extends beyond and crops out at the surface of the earth at a greater or less distance from the well itself (often many miles away), and at a considerably higher elevation than the surface of the earth at the well.

The distinguishing characteristics of a driven well as it differs from the dug well is that when the pressure is relieved from the interior of the tube which itself forms the body of the well not only does the force of gravity act to supply it with water directly from the earth, but there being no intervening body of water between the wall of the well itself and the earth surrounding it upon which the atmosphere can act directly and with greater effect to force it into the well (as it can and does in the open well), the water is supplied directly to it from the earth surrounding it in a direct inverse ratio to its distance from the well, and the friction of the water through the earth being directly as the square of its velocity, as the distance from the well increases the water moves very much slower than it does immedi-
112 ately next to the well itself; but the area of the source of supply being increased exactly in the ration of the square of its distance from the well, and the friction being increased exactly as the square of the velocity (in any given stratum), the one exactly counterbalancing the other, it follows that, from natural laws, the surface of the water in the earth, surrounding the well, is and must be maintained practically at a given level; whereas, in the open well, supplied by gravity only, the water in the earth inclines from the natural surface of the stratum in the earth to the bottom of the well, the angle of that decline decreasing as the supply is taken from the well, and, unless pumping is stopped and time allowed for a resupply, the lowering of the water in the earth extends to a continually increasing distance and a longer time is required to obtain the original quantity in the well, while the supply to the driven well is continuous and steady and practically inexhaustible, the supply in a given time being proportioned in any given soil to the size of the pipe forming the well, having openings proportionate to its size, different wells varying in the supply according to the nature of the soil in which they are inserted, but remaining virtually constant at all times in the same soil. It is not claimed nor is it a fact that water can be pumped from a driven well, in any given stratum, with greater ease than from an open well sunk into the same stratum, but the great advantages are that a much larger and more extended supply of water is controlled, and in consequence of the passage of the water through the earth, under the pressure of the atmosphere, a constant filtration is secured, thus securing both

a greater supply and better water. And where large and continuous supplies are obtained by unintermitted pumping, for days and weeks at a time, experience has shown that the quantity of water has gradually but perceptibly improved, as in the case of the wells at Bellville, heretofore mentioned, where an amount of water
113 is emptied largely exceeding the rainfall upon the entire territory not shut out from the valley by outcropping rocks upon three sides and open to salt water upon the fourth, and no practical diminution of the height of the water is observed.

One peculiar characteristic of a driven well, as distinguished from the bored artesian well, is that the driven well is for use in soil where no rock is to be penetrated, and where the pressure of the atmosphere is free to act upon the surface of the water in the earth surrounding it, while the artesian well is usually, if not always, bored into a rock stratum and is supplied with water through fissures in the rock instead of through the earth itself surrounding the entrance or opening to the well.

R. D. Q. 6. In answer to cross-question 10, which was, "If a tube is driven into a hole in the ground made by boring, and a pump screwed or soldered to the top, do you claim that to be an infringement of the patent in suit?" And your answer was, "Confined to just what is stated in the question I claim it would not be an infringement." Give the reasons for that answer.

(Objected to.)

A. The patent in suit is for a method of procuring water from the earth. One part of the patent is for the method of driving the tube which is to form the body of the well directly into the earth, down to and into a water-bearing stratum; another is the utilizing the discovery that a well so inserted into a water-bearing stratum of the earth, and having a pump attached by an air-tight connection to its upper end, will be supplied by the pressure of the atmosphere with water from the earth immediately surrounding it. Cross-question 10 does not describe this method of making a well, nor does the attaching a pump, as set forth in the question, utilize the discovery until such a pump is operated, and is but a hole in the ground and does not yet become a well or "a method of procuring water
114 from the earth," which I consider the only true construction of what will constitute a pipe so inserted in the earth a well.

Recross-examination by Mr. HAMILTON:

R. X Q. 1. Have you had any experience in the manufacture and use of pumps?

A. I have.

R. X Q. 2. Is a pump air-tight when it is in operation?

A. Yes, practically it is, if it is in connection with water.

R. X Q. 3. Would the piston in a pump, each time it is raised, leave a vacuum under it if the water had no opportunity to follow it up the stalk of the pump?

A. Yes, provided there was no opening for air to enter.

Second redirect examination:

2d R. D. Q. 1. What is your reason for saying that a pipe air-tight from end to end, open at both ends, inserted into the earth down into a water-bearing stratum, and the earth removed upwards from within it and a pump being attached by an air-tight connection, and operated, and water obtained therefrom, would, in your opinion, be an infringement of the letters patent in suit?

(Objected to.)

A. My reason is that a well so constructed and operated utilizes the discovery of Col. Green, operates upon the same principle, and is, as I claim, a complete equivalent, and when finished and operated is substantially the same thing.

115 Examination of William D. Andrews, Esq., here closed.

WM. D. ANDREWS.

Subscribed and sworn to before me this 22d day of April, 1882.

CHARLES G. COE.

Notary Public & Special Examiner by consent.

It is stipulated by and between the parties that figures 120 and 121 of plate 19 of "De l'Art, du Fontenier Sondeur et des Puits Artesiens, by F. Garnier," from which the extract, Def't's Exhibit No. 15, is taken, may be used on the trial of this cause in explanation of the exhibit.

Examination adjourned, by consent of parties, to 11 o'clock a. m., April 25th, 1882, subject to countermand and closing of testimony on part of complainants, by notifying Mr. C. S. Hamilton by telegram on Monday afternoon, April 24th, 1882.

116 United States Circuit Court, District of Connecticut. In Equity.

WM. D. ANDREWS *et al. vs.* HARRIS EAMES.

STATE OF NEW YORK, *City and County of New York:*

At the city of New York aforesaid I, Charles G. Coe, having been appointed by consent of Joseph C. Clayton, Esq., and Charles S. Hamilton, Esq., counsel for the respective parties, to act as special examiner to take the depositions of witnesses to be used at the final hearing in the case of William D. Andrews *et al. vs.* Harris Eames, in equity, on the part of complainant, now pending in the circuit court of the United States for the district of Connecticut, do hereby certify that the above-named witness, William D. Andrews, was by me, at the time and place in the foregoing record stated, duly sworn to testify the whole truth, and the said deposition was taken by me in writing in the presence of the said witness, and, when completed, signed by said witness; that the defendant had due notice of the time and place where said deposition would be taken.

And now, at the conclusion of said examination, the said original

deposition is by me transmitted to the clerk of said court, duly authenticated by my signature

[L. S.] CHARLES G. COE.
Notary Public and Special Examiner by consent, County of New York.

117 *Evidence for Defendant.*

United States Circuit Court, District of Connecticut. In Equity.

WILLIAM D. ANDREWS *et al. vs.* HARRIS EAMES.

In this case it is stipulated by counsel that the defendant may file as evidence on his part the following documentary exhibits with the same effect as if the same had been put in evidence by the defendant under the rules providing for the taking of testimony in equity cases.

1. Copy of original U. S. letters patent granted to N. W. Green Jan. 14, 1868, No. 17425, marked "Def't's Exhibit No. 1." (Certification waived.)

2. Copy of U. S. letters patent granted to James Suggett March 29, 1864, No. 42126 (certification waived), marked "Def't's Exhibit No. 2."

3. Copy (certification waived) U. S. Patent Office file-wrapper and contents, application of N. W. Green for reissued letters patent No. 4372, dated May 9, 1871, marked "Def't's Exhibit No. 3."

4. Copy English patent granted to John Goode Aug. 20, 1823, No. 4838, marked "Def't's Exhibit No. 4."

5. Extract from a printed publication entitled "Repertory of patented inventions," vol. 4, published in London in 1827, by F. & G. Underwood, at pages 113–116; marked "Def't's Exhibit No. 5."

118 6. Extracts from "Dictionary of Arts, Manufactures, and Mines," published in New York city, by D. Appleton & Co., in 1847, at pages 63, 66, 67, marked "Def't Exhibit No. 6."

7. Extract from "Mackenzie's 5,000 Receipts in all the Useful and Domestic Arts," published as early as 1840, at page 338, marked "Def't Exhibit No. 7."

8. Extract from "Rees' Cyclopedia," published at Philadelphia, Pa., by S. D. Bradfred, 1819, vol. 40, title "Well in Rural Economy," marked "Def't Exhibition No. 8."

9. Extract from "Journal of the Franklin Institute," third series, published at Philadelphia, by the Franklin Institute, 1844, vol. 7, p. 128, marked "Def't Exhibition No. 9."

10. Extract from "Brande's Encyclopedia, or Dictionary of Science, Literature, and Art," published by Harper Bros., in New York city, in 1843, vol. 3, p. 1333, under art. Well, marked "Def't Exhibit No. 10."

11. Extract from "Rees' Cyclopedia," published at Philadelphia, about 1819, by S. D. Bradford, vol. 35, title "Spring Draining Pump," marked "Def't Exhibit No. 11."

12. Extract from "London Encyclopedia," published by Thomas Tegg, at London, England, 1829, vol. 22, p. 593, marked "Def't Exhibit No. 12."

13. Extract from "Mechanics' Magazine," published by Knight and Lacey, London, England, in 1824, vol. 2, pp. 15, 16, 60, marked "Def't Exhibit No. 13."

14 Extract from "Harper's New Monthly Magazine," published by Harper Bros., New York, September, 1851, p. 540, marked "Def't Exhibit No. 14."

15. Extract from "De l'Art du Fortenier Sondeur et des Puits Artesiens," published in Paris, France, in 1822, at sections 79, 80, 88, 91, 94, 95.

And also a translation of the same extract into English, it being agreed that this translation, as well as all other translations put in evidence under this stipulation, have been made by a person who believes himself to have a proper acquaintance with such language for that purpose, this extract and translation being marked "Def't Exhibit No. 15."

16. Extract from "Bulletin du Musée de l'Industrie," pub-
119 lished by De Mat & Co., at Brussells, in 1846, vol. 10, p. 163, and translation of same, marked "Def't Exhibit No. 16."

17. Extract from "Hericart de Thury Jaillissement des Eaux," published by Bachellier, in Paris, France, in 1829, pp. 274, 275, 24, 25, 26, 27, and translation of same, marked "Def't Exhibit No. 17."

18. Extract from "F. Arago Œuvrés," published at Paris, France, by Gide and J. Baudry, and at Leipsic, by T. O. Weigel, 1856, vol. 6, p. 457, and translation of same, marked "Def't Exhibit No. 18."

19. Extract from "F. Garnier Traité sur les Puits Artesiens," published by Bachellier, Paris, France, 1826, pages 207, 209, 210, 227, 228, and also translation of same, marked "Def't Exhibit No. 19."

20. Extract from "Encyclopedia of Domestic Economy," published in New York city, in 1849, by Harper Bros., p. 848, marked "Def't Exhibit No. 20."

HYDE & JOSLYN,
Solicitors for Complainants.

The defendant here rests.

120 DEFENDANT'S EXHIBIT No. 1.

From the record in the case of William D. Andrews *et als. vs.* Theodore A. Carman.

N. W. Green's Patent, 1868.

THE UNITED STATES PATENT OFFICE.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the records of this office of the letters patent granted Nelson W. Green, dated January 14th, 1868, No. 73425, for improved method of constructing artesian wells.

In testimony thereof I, M. D. Leggett, Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed this twenty-second day of October, in the year of our Lord one thousand eight hundred and seventy-three, and of the Independence of the United States the ninety-eighth.

[L. S.] M. D. LEGGETT, *Commissioner.*

No. 73425.

THE UNITED STATES OF AMERICA.

To all to whom these letters patent shall come:

Whereas Nelson W. Green, of Cortland, New York, has alleged that he has invented a new and useful improved method of constructing artesian wells, and has made oath that he is a citizen of the United States; that he verily believes he is the original and first inventor or discoverer of the said invention, and that the same hath not, to his knowledge and belief, been previously known or used; has paid into the treasury of the United States the sum of thirty-five dollars, [and] presented a petition to the Commissioner of Patents praying that a patent may be issued therefor:

These are therefore to grant to the said Nelson W. Green, his executors, administrators, or assigns, for the term of seventeen years from the fourteenth day of January, one thousand eight hundred and sixty-eight, the full and exclusive right and liberty of mak-
121 ing, using, and vending to others to be used the said invention, a description whereof is given in the annexed schedule and made part of these presents.

In testimony whereof I have caused these letters to be made patent and the seal of the Patent Office to be hereunto affixed.

Given under my hand at the city of Washington this fourteenth day of January, in the year of our Lord one thousand eight hundred and sixty-eight, and of the Independence of the United States of America the ninety-second.

[L. S.]

W. S. OTTO,
Acting Secretary of the Interior.
T. C. THEAKER,
Commissioner of Patents.

Countersigned and sealed with the seal of the Patent Office.

UNITED STATES PATENT OFFICE.

Nelson W. Green, of Cortland, New York. Letters patent No. 73425, dated January 14th, 1868.

Improved method of constructing artesian wells. The schedule referred to in these letters patent and making part of the same.

To all whom it may concern:

Be it known that I, Nelson W. Green of Cortland, in the county of Cortland and State of New York, have invented a new and useful improvement in the manner of sinking and constructing artesian

or driven wells where no rock is to be penetrated, and of raising water therefrom; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings making a part of this specification, in which—

Fig. 1 represents a portion of the rod which is driven or forced into the ground to form the opening or hole for the insertion of the tube that forms the casing or lining of the well and the avenue through which the water is raised to or above the surface of the ground, and Fig. 2 represents a portion of the tube.

My invention consists in driving or forcing an iron or a wooden rod with a steel or iron point into the earth until it is projected to or into the water; and then withdrawing the said rod, and inserting in its place a tube of metal or wood to the same depth, through which and from which the water may be drawn by any of the usual well-known forms of pumps.

To enable others skilled in the art to make and use my in-
122 vention, I will proceed to describe the same with reference to the drawings.

The driving-rod A I construct of wood or iron, or other metal, or parts of each, with a sharp point, *b*, of steel, or otherwise, to penetrate the earth, and a slight swell, *a*, a short distance above the point, to make the hole slightly larger than the general diameter of the rod. This rod I drive, by a falling weight or other power, into the earth until its point passes sufficiently far into the water to procure the desired supply.

I then withdraw the rod and insert in its place the iron or wooden tube *b*, which may be slightly contracted at its lower end to insure its easy passage to its place. In general, this tube *b* I make of iron and of a thickness that will bear a force applied at its upper extremity sufficiently to drive or force it to its place; and where a large or continuous flow of water is desired I perforate this lower end of the tube to admit the water more freely to the inside.

The perforations *c* may be about one-half of an inch in diameter, less or more, and from one to one and a half inch apart, and the perforations may extend, from the bottom of the tube upward, from one to two feet.

The diameter of the tube should be somewhat smaller than the swell *a* on the drill end of the driving-rod A.

In localities where the water is near the surface of the ground, and the well is for temporary use only, as in the case of a moving army or for temporary camps, lighter and thinner material than iron may be used for making the tubes, as, for instance, zinc, tin, copper, or sheet metal of other kind, or even wood may be used.

The rod may be of any suitable and practicable size that can be readily driven or forced into the ground, and may be from one to three inches in diameter.

Any suitable well-known pump may be applied to raise the water up through the tube to the surface or about it.

I am aware of James Suggett's patent of March 29th, 1864, and I disclaim all secured to him therein.

Having thus fully described my invention, what I claim, and desire to secure by letters patent, is—

The herein-described process of sinking wells where no rock is to be penetrated, viz., by driving or forcing down a rod to and into the water under ground, and withdrawing it and inserting
123 a tube in its place to draw the water through, substantially as herein described.

N. W. GREEN.

Witnesses:
A. B. STOUGHTON.
JOS. PECK.

DEFENDANT'S EXHIBIT No. 2.

Suggett's Patent of 1864.

THE U. S. PATENT OFFICE.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the records of this office of the letters patent granted James Suggett, dated March 29th, 1864, No. 42126, for "Improvement in pumps for bored wells."

In testimony whereof I, J. M. Thacher, Acting Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed this 10th day of December, in the year of our Lord one thousand eight hundred and seventy-three, and of the Independence of the United States the ninety-eighth.

J. M. THACHER,
Acting Commissioner.

No. 42126.

THE UNITED STATES OF AMERICA.

To all to whom these letters patent shall come:

Whereas James Suggett, of Cortland, New York, has alleged that he has invented a new and useful improvement in pumps for bored wells, which he states has not been known or used before his application; has made oath that he is a citizen of the United States; that he does verily believe that he is the original and first inventor or discoverer of the said improvement, and that the same hath not, to the best of his knowledge and belief, been previously known or used; has paid into the Treasury of the United States the sum of thirty-five dollars, and presented a petition to the Commissioner of Patents signifying a desire of obtaining an exclusive property in the said improvement, and praying that a patent may be granted for that purpose:

These are therefore to grant, according to law, to the said James Suggett, his heirs, administrators, or assigns, for the term of seventeen years from the twenty-ninth day of March, one thousand eight hundred and sixty-four, the full and exclusive right and lib-
124 erty of making, constructing, using, and vending to others to be used the said improvement, a description whereof is given

in the words of the said James Suggett, in the schedule hereunto annexed, and is made part of these presents.

In testimony whereof I have caused these letters to be made patent, and the seal of the Patent Office has been hereunto affixed.

Given under my hand at the city of Washington this twenty-ninth day of March, in the year of our Lord one thousand eight hundred and sixty-four, and of the Independence of the United States of America the eighty-eighth.

J. P. USHER,
Secretary of the Interior.

Countersigned and sealed with the seal of the Patent Office.

D. P. HOLLOWAY,
Commissioner of Patents.

The Schedule Referred to in these Letters Patent and Making Part of the Same.

To all whom it may concern:

Be it known that I, James Suggett, of Cortland, in the county of Cortland and State of New York, have invented a new and improved method of putting down and operating bored wells; and I do hereby declare that the following is an exact and full description thereof, reference being had to the accompanying drawings and the letters of reference marked thereon.

My method of putting down a well is as follows, viz: I first bore with an ordinary drill of the same or larger size than the pipe to be used for drawing the water to the desired depth. The drill is then entirely withdrawn. I then prepare an iron pipe, *a a*, which may be lengthened as desired by adding pieces connecting them by means of the collar *d*, into which they are tightly screwed. The lower end of the pipe is perforated with holes *c c c* for a space of one or two feet to allow water to freely flow in. In the end of the pipe is fitted and riveted a conical point, *b*. The perforated portion of the pipe may be filled with old rope or rags to prevent dirt sifting in its passage through the dirt, such rope to be drawn up through the pipe after it is put down. The pipe thus prepared is driven down in the hole prepared by the drill, and pieces added as it is forced down until the perforated portion reaches the water. Any desired pump is then screwed or soldered onto the upper end of the pipe. After a slight pumping the loose dirt about the holes *c c c* is drawn off and a perfect well is formed.

By the old method pipe was forced down with the drill to the desired point. The drill was then drawn up inside the pipe,
125 leaving the pipe to act as a wall or curb for the well, and a suction or draw pipe was then passed down inside the first pipe. One great difficulty in this method was experienced in forcing down the first pipe, as it must be always larger than the drill, to admit of the drill being drawn out inside the pipe, and to reduce the pipe in size as much as possible it was necessary to use thin, and consequently weak pipe, and which would not bear driving. Whereas in my method, the drill being first put down alone, it can

be used as large or larger than the pipe, and then remove all obstructions, while the pipe which is to be put down after the drill is taken out may be made of any desired thickness, and of strength sufficient, when armed with the sharpened point *b*, to bear all necessary driving; and my method dispenses with one pipe, my pipe answering for both curb to the well and suction or draw pipe.

What I claim as my invention, and desire to secure by letters patent, is the perforated pipe *a*, with the pointed end *b*, constructed as a drill and united with a pump, all substantially as shown and described.

JAMES SUGGETT.

Witnesses:
CHAS. FOSTER.
H. L. COLLINS.
Ex'd. E. M. H.

DEFENDANT'S EXHIBIT No. 3.

THE U. S. PATENT OFFICE.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the files of this office of file wrapper and contents in the matter of the application for reissued letters patent, granted Nelson W. Greene, dated May 9th, 1871, No. 4372, for improvement in the method of constructing artesian wells.

In testimony whereof I, J. M. Thatcher, Acting Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed this second day of December, in the year of our Lord one thousand eight hundred and seventy-two, and of the Independence of the United States the ninety-seventh.

J. M. THATCHER,
Acting Commissioner.

To the Commissioner of Patents:

Your petitioner prays that he may be allowed to surrender the letters patent for a new and improved method of constructing artesian wells, granted to him January 14, 1868, and numbered
126 No. 73,425, whereof he is now sole owner, and that letters patent may be reissued to him for the same invention upon the annexed amended specification. Ahe he hereby authorizes H. T. Brown and J. W. Coombs, comprising the firm of Brown, Coombs & Co., or their accredited agents, to act as his attorneys in presenting the application, and in making all such alterations and amendments as may be required.

A. W. GREENE.

[50 cent int. rev. stamp affixed and cancelled Feb. 21, 1871.]

To whom it may concern:

Be it known that I, Nelson W. Green, of Amherst, in the county of Hampshire and State of Massachusetts, have invented a new and improved method of constructing artesian wells; and I do hereby declare that the following is a full, clear, and exact description of

the same, reference being had to the accompanying drawings, forming part of this specification.

My invention is particularly intended for the construction of artesian wells in places where no rock is to be penetrated. The methods of constructing wells previous to this invention were what have been known as "sinking" and "boring," in both of which the hole or opening constituting the well was produced by taking away a portion of the earth or rock through which it was made. This invention consists in producing the well by driving or forcing down an instrument into the ground until it reaches the water, the hole or opening thus [being] made by a mere displacement, without the taking out of the earth through which the instrument passes, of the earth which is packed around the instrument and not remove- upward as it is boring. The instrument to be employed in producing such a well, which, to distinguish it from "sunk" or "bored" wells, may be termed a "driven well," may be any that is capable of sustaining the blows or pressure necessary to drive it into the earth; but I prefer to employ a pointed rod, which, after having driven or forced down until it reaches the water, I withdraw and replace by a tube, made air tight throughout its length, except at or near its lower end, where I make openings or perforations for the admission of water, and through and from which the water may be drawn by any well known or suitable form of pump. In certain soils the use of a rod preparatory to the insertion of a tube is unnecessary, as the tube itself, through which the water is to be drawn, may be the instrument which produces the well by the act of driving it into the ground to the requisite depth.

To enable others to make and use my invention, I will
127 proceed to describe it, with reference to the drawings, in which Fig. 1 represents a portion of the pointed rod above mentioned, and Fig. 2 a portion of the tube which forms the casing or lining of the well. The driving-rod A I construct of wood or iron, or other metal, or of parts of each, with a sharp point, *b*, of steel, or otherwise, to penetrate the earth, and a slight swell, *a*, a short distance above the point, to make the hole slightly larger than the general diameter of the rod. This rod I drive by a falling weight or other power, into the earth, until its point passes sufficiently far into the water to procure the desired supply. I then withdraw the rod, and insert in its place the air-tight iron or wooden tube B, which may be slightly contracted at its lower end, to insure its easy passage to its place. In general, this tube B I maked of iron, and of a thickness that will bear a force, applied at its upper extremity, sufficient to drive or force it to its place; and, where a large and continuous flow of water is desired, I perforate this tube near its lower end, to admit the water more freely to the inside.

The perforations C may be about one-half of an inch in diameter, less or more, and from one to one and a half inch apart, and the perforations may extend, from the bottom of the tube upwards, from one to two feet.

The diameter of the tube should be somewhat smaller than the diameter of the swell A on the drill end of the driving-rod *a*. In localities where the water is near the surface of the ground, and the well is for temporary use only, as in the case of a moving army; or for temporary camps, lighter and thinner materials than iron may be used for making the tubes, as for instance zinc, tin, copper or sheet metal of other kinds, or even wood may be used.

The rod may be of any suitable or practical size that can be readily driven or forced into the ground, and may be from one to three inches in diameter. In some cases the water will flow out from the top of the tube without the aid of a pump. In other cases the aid of a pump to draw the water from the well may be necessary In the latter cases I attach to the tube by an air-tight connection any known form of pump.

What I claim as my invention, and desire to secure by letters patent, is—

The process of constructing wells by driving or forcing an instrument into the ground until it is projected into the water,
128 without removing the earth upwards as it is in boring, substantially as herein described.

(Erase by amendment, filed April 27, 1871.)

I also claim, in combination with a tubed driven well, the attachment of a pump to the tube by an air-tight connection, substantially as herein set forth.

N. W. GREEN.

Witnesses:
SIDNEY E. SMITH,
W. MORRIS SMITH.

Oath.

STATE OF NEW YORK, }
City and County of New York, } *ss:*

Nelson W. Green, the above-named petitioner, being duly sworn, deposes and says that he verily believes that by reason of an insufficient and defective specification his aforesaid letters patent are inoperative and invalid; that the said error has arisen from inadvertence, accident, or mistake, and without any fraudulent or deceptive intention, to the best of his knowledge or belief; that he is the sole owner of said letters patent, and that he verily believes himself to be the first and original inventor of the improvement in this amended specification.

N. W. GREEN.

Sworn to and subscribed before me this 21st day of Feb., 1871.

[OFFICIAL SEAL.] EPHRAIM C. FORCE,
Notary Public.

THE U. S. PATENT OFFICE.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the records of this office.

In testimony whereof I, A. M. Stout, Acting Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed this fourth day of February, in the year of our Lord one thousand eight hundred and sixty-eight, and of the Indepen[den]ce of the United States the ninety-second.

[L. S.] A. M. STOUT.

In the Supreme Court of the District of Columbia, January 7th, 1868.

In the Matter of the Interference of BYRON MUDGE for a reissue of his letters patent for mode of constructing wells, and the letters patent of James Suggett for putting down and operating bored wells, and the application of N. W. Green for a similar device.

129 Appeal from the decision of the Commissioner of Patents.

After a full and elaborate argument by counsel for all the parties in this case and an examination of the testimony I fail to discover any good reason for reversing the decision of the Commissioner of Patents, "awarding priority of invention to James Suggett in regard to what is claimed by him in this patent," and ordering a patent also to issue to Nelson W. Green in accordance with the amendment filed by him September 14th, 1867.

I am clearly of opinion that Green first put into practice the *completion* of making a driven well, and is entitled, therefore, to his patent for the broad claim of sinking wells by driving down the pump or rod without removing the dirt upward, and that Suggett was entitled to a patent for the perforated pipe and point for sinking wells, and I therefore affirm the decision of the Commissioner.

GEO. O. FISCHER,
Jus. S. C. D. C.

A true copy.
Attest: [L. S.] R. J. MEIGS, *Clerk.*

U. S. PATENT OFFICE,
WASHINGTON, D. C., *February* 25, 1871.

N. W. Green, care of Brown, Coombs & Co., Washington, D. C.

SIR: Please find below a copy of communication from the examiner; subject—reissue of patent No. 73425, January 14th, 1868, for a method of constructing artesian wells.

Filed February 24, 1871.

Very respectfully,

——— ———,
Commissioner.

EXAMINER'S ROOM NO. 96.

The first clause of this claim is rejected on reference to MacKenzie's 5,000 Receipts; subject—"Water, to raise in all situations."

The second clause is for a pump attached to a tube by an air-

tight connection. This is indispensable to the operation of a pump and a universal right. Wherever a supply of water is formed a pump may be applied without new invention.

A rejection is declared.

F. C. CONNOLLY,
Examiner.

To the Commissioner of Patents:

SIR: I hereby amend as follows the specification of my application, filed February 24th, 1871, for reissue of my letters patent No. 73425, dated January 14th, 1868, for a new and improved method of constructing artesian wells:

First. Strike out the words—

"Without the taking out of the earth through which the instrument passes," in the last three lines of page 1, and inserting in place thereof the words "of the earth which is packed" around the instrument and not removed upward from the "hole as it is in boring."

Second. Insert the words—

"Without removing the earth upward as it is in boring," after the words "into the water," in the first clause of the claim.

NELSON W. GREEN,
By attorneys, BROWN, COOMBS & CO.

Washington, D. C., February 27th, 1871.

EXAMINER'S ROOM No. 96,
WASHINGTON, D. C., *February 24th*, 1871.

A second rejection is declared for reasons given in the first rejection. The word "boring," in MacKenzie, may be fairly presumed to be used vaguely, as in popular language. An iron rod is "forced into the earth," when tin (sheet-iron) tubes are put "down the aperture," and the water flows. If it sometimes does not flow the attachment of a pump to draw it cannot be regarded as a patentable invention. It cannot be patentable to attach the pump without leaving a leakage at the place of junction, since it would be exceedingly defective workmanship to leave a leakage. It is believed that neither references nor arguments are requisite to make apparent the total absence of patentable invention in the subject-matter claimed.

T. C. CONNOLLY,
Examiner.

EXAMINER'S ROOM No. 96,
WASHINGTON, D. C., *April 7th*, 1871.

The subject-matter of the second clause of the claim is not found in the original specifications, original drawings, nor in the original model, and hence is not regarded as patentable in a reissue. The ground heretofore taken by this office, that this device is of universal use in artesian-well tubes and other connections, and is a necessity in the relation of pumps to well tubes, is not withdrawn, though not essential to a valid refusal of this part of the claim.

The examiner adheres to the objections heretofore made to the first claims.

T. C. CONNOLLY,
Examiner.

131 To the Commissioner of Patents:

SIR: I hereby amend the specification of my application for reissue of my letters patent No. 73425, dated January 14th, 1868, for improved method of constructing artesian wells, by striking out the second clause of the claim, commencing with the words "I also claim" and ending with the words "herein set forth."

With this amendment, which is in accordance with the decision of the examiner-in-chief, on appeal, I request that my patent may be reissued as early as possible.

Very respectfully, NELSON W. GREEN,
By his attorneys, BROWN, COOMBS & CO.

New York, April 24th, 1871.

DEFENDANT'S EXHIBIT No. 4.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all persons to whom these presents shall come, greeting:

This is to certify that the annexed is a true copy from the bound volumes of the library of this office of the specification, in the matter of the English Letters Patent granted John Goode, August 20th, 1823, No. 4838, for apparatus for boring earth for water.

In testimony whereof I, E. M. Marble, Commissioner of Patents, have caused the seal of the Patent Office to be affixed this seventh day of March, in the year of our Lord one thousand eight hundred and eighty-two, and of the Independence of the United States the one hundred and sixth.

[SEAL.] E. M. MARBLE, *Commisioner.*

A. D. 1823. No. 4838.

Apparatus for Boring Earth for Water.

Goode's Specifications.

To all to whom these presents shall come, I, John Goode, of Tottenham, in the county of Middlesex, engineer, send Greeting:

Whereas his most excellent majesty, King George the IV, did, by his letters patent under the great seal of that part of the
132 United Kingdom of Great Britain and Ireland called England, bearing date at Westminster, the twentieth day of August, in the fourth year of his reign, give and grant unto me, the said John Goode, my ex'ors, adm'ors, and assigns, his especial license, full power, sole privilege, and authority that I, the said John Goode, my ex'ors, adm'ors, and assigns, during the term of years therein mentioned, should and lawfully might make, use, exercise, and vend, within England, Wales, and the Tower of Berwick-upon-Tweed, my inven-

tion of "certain improvements in machinery, tools, or apparatus for boring the earth for the purpose of obtaining and raising water;" in which said letters patent there is contained a proviso that if I, the said John Goode, shall not particularly describe and ascertain the nature of my said invention, and in what manner the same is to be performed, by an instrument in writing under my hand and seal, and cause the same to be enrolled in His Majesty's High Court of Chancery within two calendar months next and immediately after the date of the said letters patent, that then the said letters patent, and all liberties and advantages whatsoever thereby granted shall utterly cease, determine, and become void, as in and by the same, relation being thereunto had, will more fully and at large appear.

Now know ye that, in compliance with the said proviso, I, the said John Goode, do hereby declare that the nature of my said invention and the manner in which the same is to be carried into effect are particularly described and ascertained in manner following, that is to say:

In the drawings hereunto annexed are represented certain tools of various formation for the purpose of boring the earth, and certain apparatus for the purpose of raising water, which constitute my "certain improvements" as aforesaid.

And in reference to the said drawings Fig. 1 represents an auger or boring tool for boring in clay and similar soils, E being the uppermost part thereof, forming a screw for the purpose of appending the same to the rod, and which same letter E denotes the same part in all the figures hereinafter described up to figure 19, the same auger being of the form of a hollow with an opening in the side thereof from the top to the bottom, as at A_1 A_1 A_1 A_1, constituting one-third of the circle as shown at C_1 C_1, which represents a view of bottom of same auger, which open space, in proportion to the whole of the said auger, I consider from experience to be the best, but when boring in loose or wetter soils I reduce the size of said opening. At A^3 is a cutting piece fastened in the internal part of the said auger by two screws or rivets, and thereby made moveable in case of requiring repair. C is the leading part for the purpose of cutting into the earth. A^1 represents an internal view of the said piece, and A^2 an external view of the same when taken out from the auger. At B is represented the bottom view of an auger formed every way similar to figure 1, but having the cutting piece fixed in the middle, in which case I make the edge at C^2 rather lower than at C^1, by which means it cuts into the earth round the side of the hole and loosens it prior to the edge piece A taking hold, which variation of the situation of the said cutting piece I find particularly useful in boring hard clays, chalks, or similar soils. D_1 D_1 D_1 D_1 is a view of the back of the lower end of the auger, figure 1, shewing by dotted lines the cutting piece fixed in the inside thereof.

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Figure 2 represents a tool for the purpose of boring in loose sandy wet soils, it being of the form of a hollow cone, having a spiral edge piece round the outside of the same at A_1 A_1 A_1 A_1 which leads into the sandy soil at B into the internal cavity of the hollow cone.

Figure 3 represents another form of auger, in every respect similar to figure 1, but having no opening up the side thereof, as figure 1, it being a perfect cylinder containing a cutting piece, as at A,, and a valve at B for the purpose of retaining what may rise into its interior, the same to be used in boring in loose wet clays or similar soils.

Figure 4 represents a pumping tool for the purpose of getting out water or water mixed with soils of any description which may have soaked into the hole in the process of boring, containing a valve at B, where it is shewn sectional. It is to be lowered into the hole by a rope at C, and by raising and lowering it at short intervals it becomes filled with water, or water and soil, when it is to be drawn up. This figure is broken in the middle to represent that these pumping tools may be formed by various lengths.

Figure 5 is another pumping tool for clearing the hole of water or loose heavy sand, and is similar to figure 4 in every respect, but contains a rod with a bucket or moving valve at A, which
134 may be raised and lowered at short intervals The stops upon the same, as seen at C C, prevent the rod from passing lower or higher by the collar bar at D. It operates as figure 4, by being raised and lowered at short intervals.

Figure 6 represents a tool for the purpose of getting rods out of the holes when they may have been broken by any casualty. A, A, is a cylindrical collar fitting the hole in the act of boring. B, is a sharp edge or chisel piece forced out by the spring C. The same is passed down into the hole wherefrom the broken rod is to be extracted, the end of which passing through the collar piece raises the edge piece B,, which [is] forced against the broken rod by means of the spring C and cuts into the same, holding firmly thereto, by which means it may be drawn out, but in some cases I find it necessary to have two cutting edges forced out by two springs in this tool, as in figure 7.

Figure 7 represents another tool for the purpose of extracting broken punches, augers, or other parts of tools from the hole. A, A, are two edge pieces which are thrown out by the springs C C against the sides of the broken tool when the same shall have come between them.

Figure 8 represents a tool for the purpose of widening the hole. A, A, are two semicircular cutting edges, A, A, $A,^1$ $A,^1$ being a view of the bottom of the same tool, and B an internal view of one of the sides.

Figure 9 represents a punch for the purpose of sinking through stone. The leading edge a^2, coming first in contact with the stone, being of smaller spread than the whole width, operates more speedily and effectually. A^3 is a bottom view of the same tool.

Figure 14 is another punching tool for the purpose of rounding the hole below it. At A A is represented a bottom view of the same. The returned edges operate on the sides of the hole and preserve the circular form thereof.

Figure 20 represents an apparatus for forcing down cast-iron pipes when the hole shall have been bored or in the course of boring, for

the purpose of keeping the upper loose soil out of the hole. B B is a block fitted into the upper part of the pipe C C C C, and having an upright rod, D D, upon which the weight A A A A slides, the same being raised by the ropes at F F and allowed to fall upon the block B B, — forces the same and the pipe down the hole, and when at proper distance another pipe may be entered into its socket and the operation continued.

Figure 19 represents a tool for the purpose of extracting an auger when broken in the hole in such a manner that the tool figure 7 will not operate. A is a guiding piece which fits the side of the hole, and B is a hook which takes under the broken tool and extracts the same from the hole.

Figure 10 represents a double bow tool for the purpose of forcing out any indentation which may have been made in wrought-iron or tin pipes when used for lining.

Figure 15 represents a pair of clamps for the purpose of turning iron pipes in the hole while in the act of forcing them down.

Figure 11 represents a tool which I call a triangle spear for bringing up any loose stones which may get into the hole and evade the action of any other tool. It operates by means of the internal teeth on the prongs *a a a* seizing the loose stone.

Figure 12 represents another tool for the purpose of raising the rods out of the hole when broken. It operates by taking hold of the rods beneath a joint, its cavity at A being only sufficiently wide to admit the rod therein.

Figure 13 represents a tool for the purpose of raising pipes from the hole. It operates by means of the surface being roughened similar to a rasp, so that it may be forced down the pipe with comparative ease; but in drawing up its teeth take hold of the pipe, and consequently extract it from the hole.

Figure 16 is another tool for raising pipes from the hole. It operates by means of the prongs A A A A passing with comparative ease when forced downwards, and forcing into the sides of the pipe when attempted to be drawn upwards, so as to bring the pipe up with them.

Figure 17 represents a tool for forcing down pipes, the lower part of the same fitting into a pipe, and the shoulder at A A taking upon the upper rim thereof.

Figure 18 represents a tool for the purpose of forcing out indentations which may arise in the pipes, and acts similarly to Figure 10.

Figure 21 represents a hole in the act of being bored. A A A A represents a scaffold of suitable strength supporting the winch or windlass B at a convenient height from the ground for the purpose of raising or lowering the rods C C C C by means of the dogs or hook pieces D D. H H are two levers for the purpose of turning the rods to perform the operation of boring, and F is a key for the purpose of unscrewing the rods as they are taken out of the hole. G G represents the surface of the earth, and I I the pipe, forced down some distance for the purpose of keeping out loose upper soil and land soaks.

Figure 22 represents a sectional view of a finished hole wherein

the water is supposed to rise to A A. B B is a long vessel having a valve at the bottom to be opened by means of a hook, C, to discharge its contents into a pail or other vessel for domestic use, and is raised and lowered by the winch or windlass D to be worked by the endless rope F F, over the upper and lower wheels G G and and H H, which renders the raising of the water convenient and easy. I I represents the surface of the earth.

Figure 23 represents another method of raising water by means of forcing a working barrel with bucket and sucker to any distance down the hole, so that the sucking pipe C C reaches into the water, by which means I avoid the expense of lining the hole with pipe; or should the water rise near the surface I form a working barrel at F, F, F, F, but in both cases I use the upper pipe F′, F′, containing two vents, one at G for common purposes, and the upper one at H for watering carts, if necessary, which said upper pipe is attached to the pipe which it is always requisite to drive to keep out land springs and the loose earth near the surface.

Figure 24 represents a method of receiving the water from a bored hole. The tube A, A′, is supposed to be stopped above A′, when the water rises and flows through the tube B B, causing the valve C, which is held down by a spring, to vibrate, and allow some small portion of the water to escape, and by such vibration raises the ball F, passes into the air vessel D D D D, and out at the pipe G G G G, to the place requiring the supply.

And moreover I do further declare that the dimensions of the various tools herein described may be varied, as may be deemed necessary for boring holes of different diameters; and in regard to the materials to be made use of for their construction, I do in preference use iron or tin for all parts except cutting parts, when I introduce steel, and that such variation of dimensions, and all more minute particulars of construction, will be with facility supplied by workmen in works of this nature.

In witness whereof I, the said John Goode, party hereto, have
137 hereunto set my hand and seal this sixteenth day of October, in the year of our Lord one thousand eight hundred and twenty-three.

JOHN GOODE. [L. S.]

And be it remembered that on the sixteenth day of October, in the year of our Lord 1823, the aforesaid John Goode came before our said Lord the King in His Chancery, and acknowledged the specification aforesaid, and all and everything therein contained and specified, in form above written; and also the specification aforesaid was stampt according to the tenor of the statute made for that purpose.

Inrolled the sixteenth day of October, in the year of our Lord one thousand eight hundred and twenty-three.

(Ex'd. S. P. P., H. M. L.)

DEFENDANT'S EXHIBIT No. 5.

From vol. 4, "Repertory of Patented Inventions," published in London, in 1827, by T. & G. Underwood, page 113. Patent granted to John Goode, of Tottenham, Middlesex, engineer, for improvements in machinery, tools, or apparatus for boring the earth for the purpose of obtaining and raising water, dated August 20, 1823. To better explain the nature of the tools for which this patent is granted we have given figures of them, to which we shall refer in the order of their numbers. Figure 3 (pl. 11) represents a long hollow auger between three and four inches in diameter; it has a slit or longitudinal opening from top to bottom at one side, and a bit or cutting piece is screwed to its bottom, which, being easily separated, much facilitates the grinding necessary for its edge. The slit at the side we suppose is for the passage of a spike or chisel to force out the earth collected within it in boring. When the earth is loose or wet the slit is reduced in size, or a cylindrical auger without any slit is used, and when this tool is employed in boring through chalk the cutting piece is placed lower, and one of the sides of the cylinder descends a little below the other; the reasons of which alterations are not explained. A second figure is given in the specification to show the alterations mentioned, but it appears to us that they may be readily conceived from the single figure.

Figure 4. The fourth figure is a hollow cone, surrounded by a spiral projecting edge, which, as the tool is turned around, causes the earth to rise up and fill the cone. * * *

138 Figure 5 is the section of a hollow tube prepared to act as a pump, being furnished with a piston and lower valve. Its use is for getting up water and sand. It is lowered down into the hole made by the other tools by means of the cord attached to its piston, which piston, being made heavy enough to descend of itself to the bottom of the tube when the cord is let down, permits the water to rise beyond its valve into the tube, and, on the cord being again drawn up, the piston, *is* rising along with it to the top, represented near its upper part, draws up more water and sand into the tube, where it is retained by the lower valve until discharged at the top. * * * Figure 6 is a tool for getting up broken boring rods, consisting of a cylinder with a catch near its bottom pressed down by a spring, which catch, having a hard, sharp edge, enters a little into the side of the rod, and thereby holds it while being drawn up. Figure 7 is a tool for the same use as figure 6, but only consists of two side pieces, having each a sharp catch at its bottom like that of figure 6. Figure 8 has two cutting pieces projecting from its bottom which serve to enlarge a hole previously made by other tools. * * * Figure 9 is a chisel, with a portion at its center made lower than the rest; it is used in penetrating stone, and is made to act by raising and lowering the rod, by various means, so as to make it serve as a hammer in driving down the chisel. * * * Figure 10 is a chisel of a different form, for the same purpose, having its lower part made in the form of a portion of a hollow cylinder; it acts more expeditiously than figure 9 when the stone is of a softer

consistence. * * * Figure 11 is an apparatus for driving down iron pipes. *a* is the pipe; *c* is the boring rod; *b* is a plug or block, fastened to the bottom of *c* and fitted to the top of *a*. On *c* the weight *d* slides up and down, being perforated through its middle for this purpose and being raised by the cords attached to it; when these are let go it acts as a hammer on the pipe *a* in impelling it downwards. * * * Figure 12 is a tool for the same purpose, being a weight, shaped like an acorn, which being let fall on the top of the pipe, by relaxing the cord which retains it, drives it downwards; this tool will be neither so certain in its effect nor so liable to injure the top of the pipe as the preceding. * * * Figure 13 is a tool for raising up a broken auger from the hole; at the bottom of its shortest arm is a portion of a tube, which serves to guide it in going down into the hole, and the hook at the end
139 of its long arm, getting under the auger, enables the workmen to draw it out. * * * Figure 14 is a tool formed by two elliptical bows, whose use is to take out indentations from copper, tin, or lead pipes when these are employed for lining the hole. * * * Figure 15 is another tool for the same purpose, containing twice the number of bows. Both tools act by being lowered into the pipe and being turned round as they descend. * * * Figure 16 is a pair of clamps fastened together by screws, which being fastened on the pipe assist the men in turning it round in the hole while being driven down. * * * Figure 17 represents a tool for drawing up a stone that is too large to enter the auger; the three claws at its bottom are elastic, and the notches at their insides are intended to prevent the stone from slipping out after being gripped. * * * Figure 18 is for raising broken rods; the angular projection in which it terminates passes beneath the rod and holds it up while being elevated. * * * Figure 19 is a tool for raising pipes from the perforation; its outside is formed like a rasp into points, which, on its being pressed into the inside of the pipe, retain it as it is raised. * * * Figure 20 is another tool for the same purpose. The pointed bars that diverge from it obliquely upwards are formed of spring temper, and yield on being pressed down withinside the pipe; but, from their direction, when once they enter the sides, they are forced more strongly outwards against them by the resistance that arises in their extrication. All the above-described tools are formed with screws at their upper ends, which enter into a hollow screw of the same tap in the lower joint of a boring rod formed on the common construction, in pieces about four feet long and about an inch thick, with a hollow screw at one end and [an] outside screw at the other, by which they are fastened together in succession as the hole deepens. A handle like that of an auger is made to fit on the top joint, by which the rod with the boring tools are turned round when these are used; but when the chisels are employed one or more spring poles are generally employed to support the rod, which, being then driven down by the men, acts, by its weight and accelerated velocity, like a hammer in impelling the chisel at its lower end, and the spring poles, in assisting to draw it up again, aid the men very much in the operation. When the

water will not flow over the top of the well, the patentee mentions that tubes with valves at their ends and containing pistons, like figure 5, moved by a cord, might be used for drawing it up;
140 but it is evident that the use of these could be only temporary, as, without pipes of some kind, the hole would soon fill up; and, when pipes were used, it is obvious that they might be made to act as a pump by being furnished with pistons and valves. Four figures are given in the specification to explain the arrangements last mentioned in addition to the figures before explained.

DEFENDANT'S EXHIBIT No. 6.

From "Dictionary of Arts, Manufactures, and Mines," by Andrew Ure, published in New York city in 1847 by D. Appleton & Co., p. 63, "Artesian Well." Under this name is designated a cylindrical perforation bored vertically down through one or more of the geological strata of the earth till it passes into a porous gravel bed containing water, placed under such incumbent pressure as to make it mount up through the perforation either to the surface or to a height convenient for the operation of a pump. * * * page 66 * * * Mr. John Goode, of Tottenham, who had been extensively employed in boring the earth for water, obtained a patent in August, 1823, for certain improved implements contrived by him to facilitate his useful labors, a description of which cannot fail to be interesting * * * p. 67. These are the new implements for which the patent was granted. In the process of boring there does not appear to be anything new proposed, but that these several tools are to be employed for boring, packing, and otherwise penetrating, raising the earth, and extracting broken or injured tools. There are also suggestions for employing long buckets, with valves opening upward in their bottoms, for the purpose of drawing water from these wells when the water will not flow over the surface; also lift-pumps, with a succesion of buckets for the same purpose. But as these suggestions possess little if any novelty, it cannot be intended to claim them as parts of the patent. * * *

DEFENDANT'S EXHIBIT No. 7.

Extract from page 388 of book "MacKenzie's 5,000 Receipts in All the Useful and Domestic Arts," which book, it is agreed by counsel for the complainants, was published as early as 1840.

"To raise water in all situations. The finest springs may
141 be found by boring, which is performed in the simplest manner by the mere use of an iron rod forced into the earth by a windlass."

"The workmen in a few days get to a genuine spring of pure water, fit for every purpose. After the water is found they merely put the tin pipes down the aperture, and it preserves a fine stream which sometimes rises from four to five feet high."

DEFENDANT'S EXHIBIT No. 8.

From "Rees' Cyclopædia," vol. 40, published at Philadelphia, Penn., by Samuel F. Bradford, about 1819, title "Well in Rural Economy."

"The most ingenious of these is that proposed by a French philosopher, who has advised that the ground should be perforated to a sufficient depth by means of an auger or borer; a cylindrical wooden pipe being then placed in the hole and driven downward with a mallet, and the boring continued, that the pipe may be forced down to a greater depth, so as to reach the water or spring. In proportion as the borer becomes filled with earth it should be drawn up and cleared, when, by adding fresh portions of pipe, the boring may be carried to much extent under ground, so that water may in most cases be thus reached and obtained. It is stated that wells made in this manner are superior to those constructed in the common method, not only in point of cheapness, but also by affording a more certain and abundant supply of water, while no accident can possibly happen to the workmen employed. In case the water near the surface should not be of a good quality, the perforation may be continued to a still greater depth till a purer fluid can be procured; and when wells have become impured or tainted from any circumstance or accident, when previously emptied, and the bottom perforated in a similar maner, so as to reach the lower sheet of water, it will rise in the cylindrical tube in a pure state into the body of the body of the pump fixed for the purpose of bringing it up."

DEFENDANT'S EXHIBIT No. 9.

From "Journal of the Franklin Institute. Third Series." Published at Philadelphia, by the Franklin Institute, 1844. Vol. VII, page 128.

"In confirmation of these views, and as a familiar practical
142 illustration, I may be permitted to mention that when the present basin was being constructed in Portsmouth dockyard, in 1796 or 1797, the piles first driven were 15 feet in length. From their length these passed entirely through the bed of clay into sand containing water. The consequence was that the water squirted up in all directions from the subjacent reservoir, and, as it was uncertain to what extent the piles would sink before they reached any solid stratum, it was resolved to shorten the piles, so that they might not pass through the clay at all, and the old holes were with some difficulty plugged up. Some years afterwards the dockheads of one of the principal docks gave way and sunk considerably, nor could any of the officers of the yard account for the recurrence. It happened at this very time that, with the late commissioner, Sir George Grey, I was examining the docks, and, recollecting the circumstance which rendered it necessary to cause the piles to be shortened—namely, their having penetrated into the sand containing water—it recurred to me to ask Sir George if any wells were at the time being sunk in the neighborhood. His reply immediately was that 'Certainly, workmen were then sinking for

water near the officers' houses.' Upon which I remarked that, if the sinking of the well was not stopped, other parts of the masonry of the docks would most assuredly give way, and that no wells should be allowed to be sunk near the dockyard, as, by giving vent to the water in the sand under the clay, the foundations of the buildings must necessarily be affected. This hint was, I believe, attended to, and the sinking of the well was stopped. In situations such as these the insertion of a pipe through the clay would afford the supply of water with much more safety, the drain being less and much more gradual."

DEFENDANT'S EXHIBIT No. 10.

From "Brande's Encyclopedia, or Dictionary of Science, Literature, and Art," published by Harper Bros., in New York city, in 1843, vol. 3, page 1333, under art. "Well."

"The use of the borer alone may procure an adequate supply of water in particular situations. This mode appears to have been long resorted to in this and other countries. From what we have already stated as to the disposition of strata the conditions requisite for its success will be readily conceived, viz., watery strata
143 connected with others on a higher level. The pressure of the water contained in the higher parts of such strata on that in the lower will readily force up the latter through any orifice, however small. All that is necessary, therefore, is to bore down to the stratum containing the water, and, having completed the bore, to insert a pipe, which may either be left to overflow into a cistern or it may terminate in a pump."

DEFENDANT'S EXHIBIT No. 11.

From "Rees' Cyclopædia," published at Philadelphia, by Samuel J. Bradford, about 1819, vol. 357; title, "Spring Draining Pump."

"It is constructed of copper, in the pipe form, in a very neat, simple, and cheap manner, so as to admit of being put down into the ground in holes formed by the boring-auger, and by being made to be wrought as a pump is capable of showing the presence of water where the pressure of it in the higher grounds above is not sufficient to force it up through the auger holes, which is the case in many instances. The nature and direction of the under strata are, in some degree, found in boring and putting the pump down through them. It is the invention and discovery of Mr. Wakefield, who has been long much engaged in the practice of draining in several different places and parts of the kingdom."

DEFENDANT'S EXHIBIT No. 12.

The "London Encyclopædia," published by Thomas Tegg, London, England, 1829, vol. XXII, page 593.

Well-tube, an hydraulic instrument for procuring water in almost every situation, suggested by M. Cadet de Vaux. He directs the soil to be placed in the hole, and driven down with a mallet; after which the boring must be continued that a pipe may be driven to a greater

depth. As the auger becomes filled with earth it ought to be drawn up and emptied, so that, by the addition of fresh portions of the pipe, the boring is carried to a considerable extent under ground, and water is in most instances obtained. Wells thus formed are preferable to those dug in the usual manner, being less expensive, while the supply of water is both copious and certain. This plan of boring for water has of late been much practiced in the neighbourhood of London.

144 DEFENDANT'S EXHIBIT No. 13.

"Mechanics' Magazine," published by Knight & Lacey, London' England, 1824, vol. II, pp. 15 and 16.

Boring Wells.

The inhabitants of the low lands and marshes adjoining the river Wavenery (county of Suffolk) are often put to great inconvenience in summer from want of water, although their wells are usually sunk below the level of the bottom of the river. As far as I know, the banks are formed of four distinct strata—1, a loose, oozy alluvium, five feet deep; 2, a loose white sand, fifteen feet deep; 3, a close-grained bog earth, twelve feet, very black; 4, an earth resembling the last, but mixed with fine sand and a few fragments of muscle and cockle shells.

The uplands in the neighbourhood rise from 50 to 100 feet above the level of the river. In sinking wells I have found no difficulty in getting down my brick-work five or six feet into the second stratum (a loose white sand), but at this depth the water from the land springs becomes troublesome, and the sand falls in such quantities that the curb on which the brick-work rests will not settle downwards. From the bottom of a well ten feet deep I have lately bored thirty feet without finding any main spring. The soil being loose, it lies close to the borer, and has prevented me getting further down, although four hands were employed. When the borer is withdrawn the aperture is immediately filled, and all our work must be gone over again.

Will any of your correspondents be so kind as to inform me, through the medium of your magazine, by what mode I can reach the main spring? If by pipe, what method ought to be used to get it down? As these wells are usually paid for by the foot, I have often been inadequately paid, owing to the time taken up in getting brick-work through this loose sand, which blows up nearly as fast as I can erect the brick.

A CONSTANT READER AND A WELL-SINKER.

"Mechanics' Magazine," published by Knight & Lacey, London, England, 1824, vol. II, page 60.

Boring Wells.

Answer to question.

LEEDS, *March* 15, 1824.

Drive a cast-iron pipe through the gravel—*i. e.*, by means of

145 a weight hung at the end of spring pole, used in boring; and should the pipe meet with any loose stone to obstruct its passage, put the boring rods into the pipe, and bore until the stone is broken to pieces or driven sideways, then drive the pipe as before. I have had the management of a great many bore holes for water in this neighbourhood, some above 100 yards deep, and many contrivances I have used on account of difficulties met with in different strata. I shall be happy to give your correspondent every information in my power on the subject, and, if agreeable to you, will send a list of a few holes, stating the different strata gone through and the several springs of water met with.

Yours, &c., T. T.

N. B.—The shell-borer must be used at times to bring out the gravel that gets into the pipe, and the pipe must have spigot and faucet joints.

DEFENDANT'S EXHIBIT No. 14.

From "Harper's New Monthly Magazine," September, 1851, page 540, published [in] New York, by Harper Bros.

In some places the soil or earth covering the first surface of rock is of such a character that it is next to impossible to sink the log through the rock; still patient contriving will do much in obviating this; for instance, after going as deep as the gravel or quicksand in which the first vein of water is found will permit, and reaming out the hole, the log is inserted, having its lower end sharpened, and defended by a tapering iron band well secured. This may be driven down without much trouble through the bed of quicksand, and a passage is thus secured to the rock.

DEFENDANT'S EXHIBIT No. 15.

From "De L'Art du Fontenier Sondeur et des Puits Artésiens," published in Paris, France, 1822, page 99, sec. 79.

Lorsque l'on a découvert des conches de calcaire, il faut alors suspendre l'approfrondissement du trou de sonde, et descendre dans l'intérieur des coffres les buses qui doivent servier à former le vide intérieur de la fontaine jaillissante; mais avant d'entrer dans des détails sur la manière dont on doit poser ces buses, il est nécessaire que nous occupions de leur construction, et que nous fassions connaître les dimensions qu'on leur donne ordinairement:

146 *Buses.*

SEC. 80. Les buses sont des tuyaux de bois de 10 pieds (3, m248) de longeur, de 7 pouces (0, m189) de diamètre exterieur, et de 2 pouces (0, m005) d'épaisseur. Pour les percer avec régularité, on emploie des machines mues par l'eau on par tout autre agent, et l'on peut voir, dans l'Architecture hydraulique de Bélidor, la description d'une de ces machines. * * * Pag. 106, sec. 88.

Sabot placé à l'extrémité de la buse ou du tuyau qui doit entrer dans le calcaire.

Le tuyau qui doit entrer dans le calcaire est garni, comme on le voit dans les Fig. 120 et 121, d'un sabot en fer analogue à celui que l'on adapte á l'extrémité inférieure des coffres.

From pages 107, 108. * * *

En recommençant plusiers fois l'opération que nous venons de décrire, on pourra descendre autant de buses qu'il en faudra pour atteindre l'endroit où les coffres se terminent. Passé ce point, on ne peut plus les enfoncer dans les argiles qu'en les frappant à petit coups de mouton.

Avantages d'enfoncer les buses à l'aide de très-légers coups de mouton. Instrument dont on se sert pour les retirer de l'interieur du trou de sonde lorsqu'elles sont fendues.

Sec. 91. Quelquefois il arrive, comme nous avons été à méme de l'observer dans deux sondages différens, que des cailloux se dérangent de leur position, et s'opposent alors à l'enfoncement des buses; l'inconvénient qui en resulte est très-grave, et si l'on cherchait à vaincre la resistance qu'opposent ces cailloux en frappant un peu fort sur ces buses avec le mouton, il est presque certain qu'on les fendrait, aussi que cela est arrivé dans les deux sondages que nous venons de citer. Il est préférable, dans ce cas, de les retirer. * * * Page 109. Lorsque l'on a rendu au trou de sonde la régularité qu'il doit avoir, on y redescend les tuyaux jusqu'à ce qu'ils soient entrés de 2 pieds (0, m65) dans le calcaire, que l'on fore préablement sur un diamètre de 7 pouces (0, m189), pour qu'ils ne puissent y entrer qu'a frottement dur. * * * Quelquefois cette eau s'élève dans les buses avec une grande vitesse, et se répand même à la surface du sol; mais plus souvent elle reste stationnaire à quelque mètres au-dessous. Page 111. Le trou de sonde ne devra pas avoir tout-à-fait le diamètre de ces buses, afin qu'elles ne puissent entrer dans le calcaire qu'à frottement dur. C'est le seul moyen à employer pour que ces eaux soient parfaitement isolées. * * * Sec. 94.

147 Moyen que l'on doit employer pour retirer les coffres lorsque les eaux souterraines s'élèvent dans les buses.

Lorsque les buses sont placées, et que les eaux s'élèvent dans leur intérieur pour se répandre à la surface du sol, ou pour rester stationnaires à quelques mètres au dessous (dans ce dernier cas, on se sert, pour les ramener au jour; de pompes semblables à celles que l'on construit dans tous les pays), il faut alors retirer les coffres à l'aide desquells on àu traversé les masses de sables mouvans. * * * Page 112. On peut ainsi retirer successivement tous les autres coffres uniques qu'on àu été dans le cas d'employer pour traverser des sables mouvans.

Translation.

When calcareous strata have been discovered it is then necessary to suspend the deepening of the hole of the bore and to put down into the inside of the boxes the wooden pipes which are to serve to form the inner vacant space of the spouting well; but, before entering into the details of the manner in which these wooden pipes should be placed in their position, it is necessary that we consider their con-

struction and make known the dimensions which are ordinarily given to them.

"Buses."

SEC. 80. The "buses" are pipes of wood 10 feet long, 7 inches in exterior diameter, and 2 inches thick. In order to bore them with regularity machines driven by water or by any other agent are employed and there may be seen in the "Architecture Hydraulique de Bélidor" the description of one of these machines. * * * Page 106, sec. 88.

Point placed on the end of the wooden tube or pipe which is to enter into the calcareous stratum.

The pipe which is to enter the calcareous stratum is furnished, as is seen in Figs. 120 and 121, with an iron point like that which is fitted to the lower extremity of the wooden boxes.

From pages 107 and 108: * * *

By commencing again several times the operation which we have just described one will be able to put down as many wooden pipes (buses) as will be necessary in order to reach the point where the wooden boxes terminate. Beyond this point they can be driven no further into the clay, but by driving them with light blows of a beetle.

148 Advantages of driving the wooden pipes (buses) by means of very light blows of a beetle. Instrument which is used to draw them out of the inside of the hole of the bore when they are split.

SEC. 91. Sometimes it happens, as we have just observed in two different borings, that pebbles drop out of their position and then interfere with the driving down of the pipes (buses); the inconvenience which results therefrom is very great, and if one should seek to overcome the resistance which these pebbles present by striking a little harder on the pipes (buses) with the beetle it is almost certain that they would be split; thus it happened in the two borings which we have just mentioned. It is preferable in this case *by* draw them out. * * * Page 109. When one has given to the hole of the bore the regularity which it ought to have the tubes are put down again until they have entered two feet into the calcareous stratum, which previously is bored a diameter of seven inches, in order that they (the tubes) can enter therein only by means of hard foreing. * * * Sometimes this water rises in the pipes (buses) with great quickness, and even spreads itself out at the surface of the ground; but oftener it remains stationary a few metres below.

Page 111. The hole of the bore should never be of the diameter of these pipes (buses), so that they (the pipes) may be able to enter the calcareous stratum only by means of hard forcing. It is the only means to employ in order that these waters may be perfectly separated. * * * Sec. 94.

The means which should be employed in order to draw out the wooden boxes when the subterranean water rise in the pipes (buses.)

When the pipes (buses) have been placed and when the waters rise

inside of them to be poured out on the surface of the ground, or to remain stationary at a few metres below (in this latter case there is used in order to draw them up pumps like those which are constructed in every country), it is then necessary to draw out the wooden boxes by means of which the masses of quicksands have been traversed. * * * Page 112. One can thus draw out in succession all the other single wooden boxes which have been used in this case in getting through the quicksands.

From "De L'Art du Fontenier Sondeur et des Puits Artésiens par F. Garnier," published in Paris in 1822, page 113, sec. 95.

. Les fontaines établies d'après les principes et les procédés que nous avons fait connaître dans ce mèmoire, peuvent donner, peudant quelque temps, une volume d'eau à peu près constant, ou
149 du moins qui ne varie qu'en raison des changemens qu'éprouve l'atmosphère, et d'où naissent les sécheresses on les pluies. Quel que fois cependant, on remarque, après certain nombre d'années, qu'une diminution, indépendante de ces variations atmosphèri ques, s'opère dans le volume d'eau que produisent ces fontaines. Pour rémedier à cet inconvénient, il faut, à l'aide d'un piston à soupape que l'on attache à une perche ou bien à la tige d'une sonde, donner une trentaine de coups dans les buses de ces fontaines. Comme la diminution dans le volume d'eau qu'elles produisent ne provient que du rétrécissement des fissures d'ou cette eau s'échappe, il s'ensuit que ces coups de piston doivent leur rendre leur largeur primitive en forçant les parties calcaires qui y sont intercalées de remonter au jour.

Nous avons executé ces operations sur une fontaine creusseé, depuis l'année 1810, dans un terrain dont la Fig. 4, Pl. II, répresente la coupe, et nous avons trouvé, après avoir donné vingt impulsions au piston, que le volume d'eau produit était, au niveau de la buse, de 21 mètres cubes par heure taudis qu'il n'était avant cette opération que de 15 mètres cubes. Quelques jours après, nous avons re-commencé à faire agir le piston, mais le volume d'eau n'a plus éprouvé de variation. Il faut donc avoir soin, pour remedier aux accidens auxquels ces fontaines peuvent êtres sujettes, et pour qu'elles puisent toujours fournir un volume d'eau à-peu-près constant, de donner de temps à autre quelques coups de piston dans l'interieur des buses dont elles sont formées.

(For a definition of the word "buses" see page 99, sec. 80 of the above work.)

Translation:

The wells established according to the principles and the processes which we have made known in this article are able for some time to furnish an almost constant supply of water, or at least one which varies only by reason of the changes which the atmosphere experiences, and from which arise droughts and rains. Sometimes, however, it is observed after a number of years that a diminution independent of these atmospheric variations is brought about in the volume of water which these wells produce. In order to remedy this incon-

venience it is necessary by the aid of a valved piston, which is attached to a pole or else to the shaft of a sounding rod, to give about thirty strokes in the pipes which form the lining of the well. As the diminution in the volume of water which they (the wells) supply arises from only the narrowing of the fissures through which the water bursts, it follows that these strokes of the piston should restore to them their original size by forcing the calcareous parts, which are interpolated there, to ascend to the aperture at the surface of the ground.

We have performed these operations on a well made since the year 1810 in a piece of ground of which Fig. 4, plate II, represents the vertical section, and we have found, after having given twenty strokes of the piston, that the volume of water produced was at the top (level) of the tube forming the lining of the well twenty-one cubic metres per hour, whilst that it was before this operation only fifteen cubic metres. Some days after we have recommenced to operate the piston, but the volume of water no longer experienced any variation. It is necessary then to take care in order to remedy the accidents to which these wells may be subject, and in order that they may be able to furnish a volume of water almost always the same in amount, to give from time to time a few strokes of the piston in the interior of the pipes of which they (the wells) are constructed.

DEFENDANT'S EXHIBIT No. 16.

"Bulletin du Musée de l'Industrie," published by De Mot et Co., Bruxelles 1846, tome 10, page 163.

"Dans le système que je viens de décrire, on voit que l'injection de l'eau a lieu par l'intérieur de la sonde; l'experience m'a fait reconnaître que, lorsqu'il s'agit de recontrer des graviers ou des pierres d'un certain volume, il valait mieux injecter l'eau par le trou et la faire remonter par la sonde. La vitesse plus grande qu'il est possible d'imprimer à l'eau, et le calibre plus exact de l'intérieur du tube, permettent de remonter tous les corps qui peuvent se trouver au foud du puits, et que la manœuvre ordinaire ne pourrait pas attaquer avec avantage. J'ai remonté, par ce moyen, des cailloux de 6 centimètres de longueur sur 3 centimètres de grosseur.

"L'idée de faire remonter l'eau par l'intérieur de la sonde offre un moyen facile de forer au-dessous d'une nappe d'eau jaillissante sans avoir besoin de pompe; il suffira de fermer hermétiquement l'orifice du puits, de manière à laisser libre le jeu de la sonde, et à ce que l'eau jaillissante soit forcée d'aller toujours chercher le bas du tube pour trouver une issue; elle y entraînera et ramènera au jour tous les déblais.

151 "Si l'on ajoute à tout cela la possibilité de faire en bois la tige creuse de la sonde, et de l'équilibrer de manière à ce qu'elle ne pèse pas plus que l'eau dans laquelle elle doit se mouvoir, le problème du sondage, à des profondeurs de 1,000 mètres et de plus, paraîtra résolu."

Translation.

In the system which I have just described it is seen that the injection of the water takes place through the interior of the bore. Experience has caused me to discover that where it is a question of encountering gravel or stones of a certain size it was better to inject the water through the hole and cause it to come up through the pipe of the boring apparatus. The greatest velocity which it is possible to communicate to the water and the more accurate calibre of the insile of the tube permit the coming up of all the bodies which can be found at the bottom of the well, and which the ordinary manœuvre would not be able to attack with advantage. I have brought up by this means pebbles of six centimetres in length and three centimetres in thickness.

The idea of causing the water to come up through the inside of the pipe of the well offers an easy means of boring below a sheet of gushing water without the need of a pump. It will suffice to close hermetically the hole of the well in such a manner as to leave free the working of the tube of the well, and so that the spouting water may always be compelled to seek the inferior extremity of the tube in order to find an outlet. It will draw there and bring up to the surface of the ground all the detritus.

If there is added to all that the possibility of making the hollow rod of the boring apparatus out of wood, and to place it in equilibrium in such a manner that it does not weigh more than the water in which it is to operate, the problem of boring to depths of one thousand metres and more would appear to be solved.

DEFENDANT'S EXHIBIT No. 17.

"Héricart de Thury, Jaillissement des Eaux," published by Bachelier, Paris, France, 1829, pp. 274–75.

Les résultats donnés par le puits d'exploration, confirmant les présomptions sur l'existence d'une ou d' plusieurs nappes d'eau, dans le territoire de Saint-Ouen, déterminèrent le percement definitif du puits artésien, qui ne consistait plus dèslors, 1° que dans l'agrandissement du diamètre du trou de sonde, pour la descente des tubes destinés à isoler et à conserver les eaux ascendantes;
152 et 2° que dans le dégorgement des différens bancs où des engorgement subits pouvaient entraver l'ascension de ces eaux.

Ce travail fut commencé le 29 décembre, et poursuivi jusqu'à la profondeur de 49^{m}, 20 dans les calcaires grenus. Un engorgement se manifesta lors de leur percement; on pensa que si l'on pouvait approfondir le trou de sonde à travers et au-delà de cet engorgement, on déterminerait peut-être l'arrivée et le remontage des eaux. On descendit donc le forage jusqu'à 60^{m} et on plaça sur le tube une pompe d'un fort diamètre qu'on fit jouer plusieurs heures. Le trou de sonde se remplit d'abord de sable, de fragments de cailloux et de calcaires grenus; ensuite les eaux arrivèrent, mais troubles et argilo-marneuses. Cependant dans cet état elles prirent un niveau égal à la hauteur du couronnement des murs du bassin et s'y maintinrent.

Le trou de sonde fût alors entièrement nettoyé; la pompe y fut encore appliquée; il s'en suivit un nouvel éboulement avec engorgement, mais moindre que le premier. Les eaux, qui étaient tantôt limpides, s'élevèrent cette fois à 0m, 50 au-dessus du couronnement des murs de la gare.

On dégorgea de nouveau le trou de sande, l'opération se fit sans difficultée; il n'y eut plus d'engorgement, les eaux arrivèrent limpides et quels que soient les efforts que l'on ait faits depuis, la pompe n'a pu faire varier un seul instant le niveau.

"Héricart de Thury, Jaillissement des Eaux," published by Bachelier, Paris, France, 1829, pp. 24 and 25.

"On creuse d'abord un bassin de grandeur arbitraire, dont le fond doit être plus bas que le niveau auquel l'eau peut monter d'elle-même, afin de la recevoir; on prend ensuite un pilot d'une longueur et d'une grosseur convenables; on perce dans toute sa longueur, avec les tarrières ordinaires, un trou de trois pouces de diamètre, et on le garnit de fer par les deux bouts, dont celui qui doit entrer en terre doit être le plus aigu qu'on pourra; on enfonce ce pilot avec le mouton autant qu'il est possible, et, lors qu'il n'y a plus moyen de la faire entrer plus avant, on emploie la tarrière qui doit achever de percer le puits.

"Héricart de Thury, Jaillissement des Eaux," published by Bachelier, Paris, France, 1829, pp. 26 and 27.

"On peut ajouter que, dands les endroits où l'eau ne pourra pas monter assez près du rez-de-chaussée pour être reçue dans un bassin, ces puits ne laisseront pas d'être utiles si, faisant tomber l'eau dans quelque réservoir aussi haut qu'elle pourra monter, on
153 peut lui donner de là un écoulement dans quelque autre lieu voisin plus bas que reservoir, ce qui pourra se faire par un aqueduc souterrain, ou même par un syphon qui passe à fleur de terre, et alors on fera tomber l'eau, qui sortirait du canal ou du syphon, dans un bassin, comme on le pratique ordinairement dans tous les lieux où il y a des fontaines voisines; ou bien, sans faire tout cela, on élevera l'eau au-dessus du rez-de-chaussée par le moyen d'une pompe pourvu que cette hauteur ne passe point 29 ou 30 pieds, ne pouvant la faire monter plus haut, par les raisons que j'ai donnée dans le discours sur les effets de l'air, qui est à la fin de mon cours de mathématiques.

Translation.

The results obtained from the well of exploration, confirming the presumptions of the existence of one or several sheets of water in the region of St. Ouen, decided positively the boring of the artesian well, which consisted thenceforth of, first, only in the enlargement of the hole of the bore for the descent of the tubes intended to isolate and preserve the ascending waters; and, second, in the clearing out of the different beds where unexpected obstructions might impede the ascent of these waters.

This work was commenced the 29th of December and followed to

the depth of forty-nine metres—twenty in the granular limestone. An obstruction then manifested itself in their boring. They thought that if they were able to deepen the hole of the bore through and beyond this obstruction they would ascertain, perhaps, the coming and the ascending of the water. They then drove down the boring to the depth of sixty metres and put upon the tube a pump of a large diameter, which was made to act for several hours. The hole of the boring apparatus was filled at first with sand, with fragments of pebbles, and granulated limestone. Finally the water came, but turbid and impregnated with clayey marl. However, in this condition it (the water) took a level equal to the height of the coping of the walls of the basin, and maintained itself there.

The hole of the boring was then completely cleansed; the pump was again applied to it; there followed a new falling in with an obstruction, but less than the first. The water, which was soon limpid, rose this time to a half a metre above the coping of the walls of the platform. The hole of the bore was unstopped again; the operation was done without difficulty; there was no further obstruc-
154 tion; the water came limpid, and, whatever may be the efforts which have since been made, the pump has not been able to vary for a single instant the level of the water.

Pages 24 and 25.

They dig at first a basin of arbitary size, the bottom of which ought to be lower than the level to which the water can rise of itself in order to receive it. They take then a pile of considerable length and thickness; they bore through its entire length with the ordinary augers a hole of three inches in diameter, and they furnish it with iron at the two ends. The one which is to enter into the ground should be as sharp as possible. They drive this pile with the beetle as far as possible, and when there is no means of making it enter any further they employ the auger, which should finish the boring of the well.

Pages 26 and 27.

It may be added that in the places where the water cannot rise sufficiently near to the level of the ground in order to be received into a basin, these wells will nevertheless be useful if causing the water to fall into some reservoir as high as it will rise. One can give to it from there a flow into some neighboring place, lower than the reservoir, which can be done by a subterranean aqueduct, or even by a syphon, which passes on a level with the ground, and then one will cause the water which comes from the canal or the syphon to fall into a basin, as they ordinarily do in all places where there are neighboring wells; or else, without doing all that, they will raise the water above the level of the ground by means of a pump, provided that this height does not exceed 29 or 30 feet, not being able to raise it higher for the reasons which I have given in the discourse on the effects of the air, which is at the end of my course of mathematics.

DEFENDANT'S EXHIBIT No. 18.

"F. Arago, Œuvres," tome 6, by Gide et J. Baudry, Paris, and Leipzig, by J. O. Weigel, 1856, p. 457.

"Dans le système que je viens de décrire, on voit que l'injection de l'eau a lieu par l'intérieur de la sonde; l'expérience m'a fait reconnaître que, lorsqu'il s'agit de rencontrer des graviers ou des pierres d'un certain volume, il valait mieux injecter l'eau par le trou et la faire remonter par la sonde. La vitesse plus grande qu'il
155 est possible d'imprimer à l'eau, et le calibre plus exact de l'intérieur du tube, permettent de remonter tous les corps qui peuvent se trouver au fond du puits, et que le manœuvre ordinaire ne pourrait pas attaquer avec avantage. J'ai remonté, par ce moyen, des cailloux de 6 centimètres de longueur sur 3 centimètres de grosseur.

"L'idée de faire remonter l'eau par l'intérieur de la sonde offre un moyen facile de forer au-dessous d'une nappe d'eau jaillissante sans avoir besoin de pompe; il suffira de fermer hermétiquement l'orifice du puits, de manière à laisser libre le jeu de la sonde, et à ce que l'eau jaillissante soit forcée d'aller toujours chercher le bas du tube pour trouver une issue; elle y entraînera et ramènera au jour tous les déblais."

Translation.

In the system which I have just described it is seen that the injection of the water takes place through the inside of the boring apparatus. Experience has caused me to discover that when it is a question of encountering gravel or stones of a certain size it was better to inject the water through the hole and cause it to come up through the pipe of the boring apparatus. The greater velocity which it is possible to communicate to the water and the more exact calibre of the inside of the tube permit the coming up of all bodies which can be found at the bottom of the well, and which the ordinary manœuvre would not be able to attack with advantage. I have brought up by this means pebbles of six centimetres in length and three centimetres in thickness.

The idea of causing the water to come up through the inside of the pipe of the well offers an easy means of boring below a sheet of gushing water without having need of a pump. It will suffice to close hermetically the hole of the well in such a manner as to leave free the working of the tube of the well, and so that the spouting water may be always compelled to seek the inferior extremity of the tube in order to find an outlet. It will drag to it and bring up to the surface of the ground all the detritus.

DEFENDANT'S EXHIBIT No. 19.

"F. Garnier, Traité sur les Puits Artésiens," published by Bachelier, Paris, France, 1826, page 207.

§ 99. Lorsque les buses sont placées, et que les eaux s'élèvent
156 dans leur intérieur pour se répandre à la surface du sol, ou pour rester stationnaires à quelques mètres audessous (dans

ce dernier cas, on se sert, pour les ramener au jour, de pompes semblables à celles que l'on construit dans tours les pays), il faut alors retirer les coffres à l'aide desquels on a traversé les masses de sables mouvans.

" F. Garnier, Traité sur les Puits Artésiens," published by Bachelier, Paris, France, 1826, pp. 209 and 210.

§ 100. Les fontaines établies d'après les principes et les procé des que nous avons fait connaître dans cet ouvrage, peuvent donner, pendant quelque temps, un volume d'eau à peu près constant, ou du moins qui ne varie qu'en raison des changements qu'éprouve l'atmosphère, et d'où naissent les sécheresses ou les pluies. Quelquefois cependant on remarque, après un certain nombre d'années, qu'une diminution indépendante de ces variations atmosphériques s'opère dans le volume d'eau que produisent ces fontaines. Pour remédier à cet incovénient, il faut, à l'aide d'un piston à soupape, que l'on attache à une perche ou bien à la tige d'une sonde, donner une trentaine de coups dans les buses de ces fontaines. Comme la diminution, dans le volume d'eau qu'elles produisent ne provient que du rétrécissement des fissures d'où cette eau s'échappe, il s'ensuit que ces coups de piston doivent leur rendre leur largeur primitive en forçant les parties calcaires qui y sont intercalées de remonter au jour.

Nous avons exécuté ces opérations sur une fontaine creusée, depuis l'année 1810, dans un terrain dont la Fig. 4, Pl. II, représente la coupe, et nous avons trouvé, après avoir donné vingt impulsions au piston que le volume d'eau produit était, au niveau de la buse, 21 mètres cubes par heure, tandis qu'il n'était, avant cette opération, que de 15 mètres cubes. Quelques jours après, nous avons recommencé à faire agir le piston, mais le volume d'eau n'a plus éprouvé de variation. Il faut donc avir soin, pour remédier aux accidens auxquels ces fontaines peuvent êtr sujettes, et pour qu'elles puissent toujours fournir un volume d'eau à près constant, de donner de temps à autre quelques coups de piston dans l'intérieur des buses dont elles sont formées.

" F. Garnier, Traité sur les Puits Artésiens," published by Bachelier, Paris, France, 1826, pp. 227 and 228.

Comme les cylindres de fonte dont nous venons de nous occuper résistent très bien aux percussions qu'on leur fait éprouver, et que leurs dimensions sont beaucoup plus faibles que celles des
157 coffres que nous avons décrits, on porvient presque toujours, à l'aide de cylindres d'une seule et même largeur, à contenir les sables que l'on rencontre, lors même que leur épaisseur surpasserait celle de 100 pieds (32^{m}, 484).

Lorsque ces sables sont parfaitement maintenus, on poursuit alors au milieu des argiles le trou de sonde, en lui donnant, jusqu'à ce que l'on ait atteint de calcaire craïeux, un diamètre de 4 pouces (0^{m}, 108). On enfonce ensuite, depuis la surface du sol jusqu'à la naissance des sources d'eaux pures, des tuyaux de cuivre de 3 pouces 8 lignes (0^{m},007) de diamètre intérieur, et de 2 lignes (0^{m}, 004) d'épaisseur. Ces tuyaux, que l'on étame ordinairement à l'intérieur, servent à

isoler ces eaux de celles qui leur sont superieures, et qui, souvent, proviennent de terrains renfermant des groupes de pyrites ferrugineuses. Pour pouvoir les enfoncer facilement, ou les soude successivement les uns aux autres, en introduisant un fer rouge dans leur intérieur, jusqu'à l'endroit où ils se joignent. Lorsqu'ils sont définitivement en place, on remplit alors l'espace qui existe entre les cylindres de fonte et ces tubes de cuivre, afin qu'il n'y ait aucune espèce de communication entre les terrains supérieurs et inférieurs, soit avec de l'argile, soit avec un mélange de cendres de houille et de chaux vive.

La méthode que nous venons de décrire, et qui, comme on le voit, a beaucoup d'analogie avec celle que l'on pratique en France, présente, sous le rapport de la main d'œuvre, d'assez grands avantages; l'expérience prouve, en effet, que l'on passe plus promtement les couches de sables en se servant de cylindres de fonte que de coffres en bois, et cela, parce que le terrain n'a pas besoin d'être foré sur un aussi grand diamètre; mais, d'un autre côté, les tuyaux de fonte et de cuivre entraînent des dépenses beaucoup plus considérables. Aussi, nous pensons que, quoiqu'une fontaine soit moin susceptible de se détruire lorsque les eaux se repandent à la surface du sol en traversant des tuyaux de cuivre que des buses de bois, on ne doit néaumoins employer les procédés anglais que lorsqu'il s'agit d'établir des fontaines dans des terrains qui présentent, pour être traversés, de grandes difficultés, et qui exigent l'emploi de trois ou quatre coffres, parce qu'alors les dépenses sont à peut près sembables dans l'un et l'autre cas.

Translation.

When the pipes (tubes) have been placed, and when the waters rise inside of them to be poured out on the surface of
158 the ground, or to remain stationary at a few metres below (in this last case they use, in order to draw them (the water) up, pumps like those constructed in all countries), it is then necessary to draw out the wooden boxes, by the aid of which the masses of quicksands have been traversed.

Pp. 209 and 210.

The wells established according to the principles and the processes which we have made known in this work are able for some time to furnish an almost constant supply of water, or at least one which varies only by reason of the changes which the atmosphere experience*d*, and from which arise droughts and rains. Sometimes, however, it is observed, after a number of years, that a diminution independent of these atmospheric variations is brought about in the volume of water which these wells produce. In order to remedy this inconvenience, it is necessary, by the aid of a valved piston, which is attached to a pole, or else to the shaft of a sounding-rod, to give about thirty strokes in the pipes which form the lining of the well. As the diminution in the volume of water which they (the wells) supply arises from only the narrowing of the fissures through which the water bursts, it follows that these strokes of the piston

should restore to them their original size by forcing the calcareous parts which are interpolated there to ascend to the aperture at the surface of the ground.

We have performed these operations on a well made since the year 1810 in a piece of ground of which Fig. 4, Plate II, represents the vertical section, and we have found, after having given twenty strokes of the piston, that the volume of water produced was at the top (level) of the tube forming the lining of well twenty-one cubic metres per hour, whilst that it was before this operation only fifteen cubic metres. Some days after we have recommenced to operate the piston, but the volume of water no longer experienced any variation. It is necessary, then, to take care, in order to remedy the accidents to which these wells may be subject, and in order that they may be able to furnish a volume of water almost always the same in amount, to give from time to time a few strokes of the piston in the interior (inside) of the pipes of which they (the wells) are constructed.

Pp. 227 and 228.

As the cast-iron pipes about which we have just been occupied resist very well the percussion which they are made to experience, and their dimensions are much less than those of the wooden
159 boxes which we have described, one *success* almost always, by means of pipes of a single and same size, to restrain the sands which are met, even when their (the sands) thickness exceeds 100 feet.

When these sands are perfectly supported, they proceed then with the boring into the midst of the clay, giving to it, until they have reached the chalky limestone, a diameter of four inches (0^{m}, 108.) They then drive down from the surface of the ground to the springs of the sources of pure water tubes of copper of three inches and eight lines in diameter and of two lines thickness. Three tubes, which are generally plated in the inside, serve to separate these waters from those which are above them, and which often spring from soils containing groups of iron pyrites. In order to be able to drive them down easily, they are soldered one to the other in succession by introducing into the inside a red-hot iron at the point where they are gained. When they are definitely placed, they then fill up the space which exists between the cast-iron pipes and these tubes of copper, in order that there may be no kind of communication between the upper and lower soils, either with clay or with a mixture of coal ashes and quicklime.

The method which we have just described, and which, as is seen, has much analogy with that which is practised in France, presents in relation to the workmanship considerably great advantages. Experience proves, in fact, that the beds of sand are passed more quickly by using cylinders of cast iron than with boxes of wood, and that because the ground need not be bored to so great a diameter; but, on the other hand, tubes of cast iron and of copper entail much larger expense. Also, we think that although a well may be less susceptible of falling into decay when the water spreads out on

the surface of the ground by passing through tubes of copper than pipes of wood, one should nevertheless employ the English process only when it is a question of placing wells in grounds which present, in order to be passed through, great difficulties, and which require the use of three or four boxes, because then the expense is very nearly the same in both cases.

DEFENDANT'S EXHIBIT No. 20.

From "The Encyclopedia of Domestic Economy," published in New York city in 1849, by Harper Bros., p. 848.

160 In the sucking pump (Fig. 756) the raising of the water is assisted by the pressure of the atmosphere. It is known that this pressure is equal to the weight of a column of water about thirty-two feet in height, according to the height of the barometer; water can, therefore, be raised so high, but not higher, by taking advantage of this pressure. To effect this a tube or cylinder is provided, thirty-two feet in length, *a b*, called the suction pipe, which is plunged into the water to be raised, having some contrivance at the bottom to prevent the water to enter, but keep back pebbles and dirt, and a valve opening upward at the top, *g*. On this is placed another short cylinder, *c d*, but of larger diameter; this has a piston, *f*, working in it, upward and downward, by means of the rod *k*. When this piston (which must fit very exactly into the cylinder in which it works) is pushed down, its valve will rise, the air beneath acting in the same manner as the water in the lifting pump, and when the piston is raised its valve will close, and it will lift up the air that is above it, but by this means a portion of air has been withdrawn from the space between the two valves, and the air in the suction pipe, by its elasticity, hastens to supply the vacuum then formed, and opens the lower valve, *g*. Through the extrication of a portion of air by the upward motion of the piston the whole of the air beneath it is [in] some degree rarefied, and consequently the pressure upon the water at *b*, in the inside of the suction pipe, is not now so great as before, and is less than that upon the surface of the water at *h* and *i*, on the outside, which has the undiminished pressure of the atmosphere. The consequence of this unequal pressure on the water, within and without the suction pipe, is that water is forced into the interior of the latter and rises at each stroke of the piston until it reaches it. On the next action of the piston it works in the water, and the effect is the same as was described in the lifting pump, the piston lifting at each stroke the water above it; but, as the piston is made to work near the top and near the place of delivery, this weight is very little, the pressure of the atmosphere now always keeping up the water as high as the piston. The water *is* so raised now runs out by a short pipe at the side *m*. To provide for the constancy of this stream, a small reservoir, *n o*, is formed upon the top of the pump. It is scarcely necessary to observe that the piston rod is usually moved up and down by a lever called the pump handle.

160½ And at the term of said court held at Hartford on the third Tuesday of September, 1882, the plaintiffs, by E. H. Hyde,

Jr., J. C. Clayton, and A. Q. Keasby, their counsel, duly appeared to prosecute said suit, and the defendant, by C. S. Hamilton and Charles R. Ingersoll, also appeared, and said cause was fully heard.

And on the 14th day of July, 1882, the court filed its opinion in the words and figures following, viz:

161 *Opinion. Filed February 8th*, 1883.

Circuit Court of the United States for the District of Connecticut.

WM. D. ANDREWS *et al. v.* HARRIS EAMES.

SHIPMAN, *J:*

This is a bill in equity to restrain the defendant from the infringement of reissued letters patent [granted] to Nelson W. Green, dated May 9th, 1871, and commonly known as the "driven well patent." The original patent was issued January 14th, 1868.

The litigation upon the construction and validity of this patent began in the United States circuit court for the eastern district of New York. Judge Benedict's opinion sustaining the patent (Andrews *v.* Carman, 13 Blatchf., C. C. R., 307) has been followed by Judge Blatchford (Andrews *v.* Cross, 8 Fed. Rep., 269) and by the circuit courts in other districts wherever the question has been tried. The decision of Judge Gresham in Hine *v.* Wahl, also sustaining the patent, has recently been affirmed by an equally divided Supreme Court.

In this state of the litigation the construction which was given to the patent by Judges Benedict and Blatchford will be followed without discussion.

The defendant relied upon the invalidity of the reissued patent, its want of novelty, and upon non-infringement.

162 The first defence presents a question upon which I much desired to read the views of the Supreme Court in Hine *v.* Wahl, where the question was directly made, but, in view of the fact that the court did not declare the reissue invalid, it is not improper to regard the patent as sustained. I may add that my own opinion tends in favor of the validity of the reissue.

Upon the question of novelty the Goode patent and the other printed exhibits have reference to an artesian well made by boring, and not to a well made by driving and without moving the earth upward.

The remaining question is that of infringement. The defendant's two wells were made by Frederick B. Platt and Daniel Clark.

Platt's testimony is as follows:

Q. 6. State fully and particularly the process used by you in constructing these wells.

A. We had a hollow auger that bored a hole about three inches in diameter, with which we bored the hole till we struck water; then we coupled the pipe together and either drove or pressed the pipe into the water below the strainer.

Q. 7. What do you mean by driving or pressing the pipe into the water below the strainer?

A. I mean by driving the pipe striking it on top with a maul and by pressing it; we put a chain on the pipe above, and used a lever with a purchase to push it down; this was done after the hole was bored.

Q. 10. How far did you ordinarly drive or press the pipe?

A. From three to five feet.

Q. 11. Into what did you drive or press the pipe?

A. Into the wet sand.

Q. 20. Describe fully and particularly the process used by you in constructing these (the defendant's) wells, specifying what difference there was, if any, between them.

A. I don't know as there was any difference from what I
163 have described; we bored a hole, as I said before, in the ground to the water, inserted the pipe, and either drove or pressed the pipe into the water from three to six feet, and attached a pump to the top, a pump constructed for a driven well, I believe.

Q. 21. What do you mean by into the water?

A. The water in the ground.

Q. 22. You did not strike a solid body of water, did you?

A. I struck water enough to supply the pump; that was all we was after, generally.

Q. 23. Do you mean by into the water into the water-bearing stratum of the earth?

A. I suppose so.

Q. 24. What was your object in driving or pressing the pipe in the manner which you have testified?

A. To get a supply of water for the pump.

Q. 25. State whether or not a supply of water was furnished for the pump before the pressing or driving took place.

A. It was not.

Q. 29. State whether or not, after driving or pressing the pipes, as you have testified to, you removed any earth upward in constructing these wells.

A. No, sir.

The testimony of Clark is more brief, but to the same effect.

The defendant's counsel strenously urge that these wells were constructed by boring; that the wells were bored until water was struck—that is, until a supply of water was obtained—and that the wells were finished by pressing the pipes more deeply into the source of supply which had been reached when the workmen "struck water." In other words the defendant seeks to bring the case within the decision of Judge McCrary in Andrews *v.* Long, 12 Fed. Rep., 871.

164 In this case, however, the witnesses, when they used the common expression "struck water," did not mean that they had reached an adequate source of supply for a well, but that they had reached a place where the presence of water manifested itself, and where by continuous excavation an adequate supply would be attained. The wet sand or wet clay upon the auger showed that

water was at hand. The well was then finished and a supply of water was obtained by pressing or driving a tube into the ground, without removing the earth upward, and attaching thereto a pump. When this was done there was put "to practical use the new principle of forcing the water in the water-bearing strata of the earth from the earth into a well pit by the use of artificial power applied to create a vacuum in the water-bearing strata of the earth, and at the same time in the well pit."

Andrews *v.* Cross, 8 Fed. Rep., 269.

A workman in our New England soil would not ordinarily be able to drive or press a tube into the stony or tough crust which must be penetrated before water-bearing strata are reached, but it is no adequate argument against infringement that it is necessary to bore or dig into the rough and hard soil or the mass of tough clay which lies over the sources of water supply provided, before a supply of water is reached, the patented process is thereafter used for the purpose of obtaining an adequate flow of water upon the surface of the ground.

Let there be the usual decree for an injunction and an accounting.

E. H. Hyde, Jr., J. C. Clayton, and A. Q. Keasby, for plaintiffs; C. S. Hamilton and Charles R. Ingersoll, for defendant.

165 And on the 2d day of July, 1883, the following final decree was made and entered in said cause, viz:

In the Circuit Court of the United States for the District of Connecticut. In Equity.

WM. D. ANDREWS, GEORGE H. ANDREWS, AND NELSON W. GREEN
v.
HARRIS EAMES.

This cause came on to be heard at the — term of said court, A. D. 188-, upon pleadings and proofs, and was argued by counsel for the respective parties, and the court having considered said pleadings, proofs, and arguments, upon due consideration thereof, it is now hereby ordered, adjudged, and decreed as follows:

That the reissued letters patent No. 4372 of the United States, granted to said Nelson W. Green on the ninth day of May, 1871, for improvements in wells, being the letters patent referred to in the bill of complaint herein, are good and valid in law, and that the said Nelson W. Green was and is the original and first inventor and discoverer of the improvements described and claimed therein.

166 That the complainants, Wm. D. Andrews, George H. Andrews, and Nelson W. Green, are the exclusive owners of the said letters patent for the county of New Haven, in the State of Connecticut, within this district, and of all rights of action for the infringement thereof.

That the said defendant herein, Harris Eames, has infringed upon

said letters patent and upon the exclusive rights of the complainants under the same by the construction and use of wells, as charged in said bill of complaint.

And is is further ordered, adjudged, and decreed that the complainants do recover of said defendant the profits, gains, and advantages which he has made or received, or which in any way have arisen or accrued to him from the infringement of the said reissued letters patent, by practising, making, using, or selling the invention and thing patented or described and secured by said reissued letters patent No. 1372 since the grant and issue thereof, on the 9th day of May, A. D. 1871, and also the damages which the complainants have or may have sustained by reason of any infringement of said reissued letters patent by the defendant.

And the said parties hereto having agreed between themselves that said profits, gains, and advantages, and damages amount to
167 the sum of twenty dollars, and having waived a reference to a master to take an account of and report to the court the same, said agreement and waiver *is* hereby ratified and affirmed, and it is ordered and decreed that the complainants recover therefor of the defendant the said sum of twenty dollars.

And it is further ordered and decreed that a perpetual injunction be issued against the defendant according to the prayer of the bill.

And it is further ordered and decreed that the complainants recover of the defendant their costs of suit.

N. SHIPMAN,
District Judge.

168 I, Edwin E. Marvin, clerk of the circuit court of the United States for the district of Connecticut, do certify that the annexed papers are true copies of the original judgment record in the matter of William D. Andrews *et al. vs.* Harris Eames, recorded and on file in said court.

In testimony whereof I have set hereunto my name officially and the seal of said court, at Hartford, in said district, this 11th day of September, A. D. 1883.

[Seal of Circuit Court, Connecticut.]

EDWIN E. MARVIN, *Clerk.*

Endorsed on cover: Connecticut C. C. U. S. No. 120. Harris Eames, appellant, *vs.* William D. Andrews, George H. Andrews, and Nelson W. Green. Filed 9th October, 1883.

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EQUITABLE ESTOPPEL, cases on page 76 of brief.

"If one person is induced to do an act prejudicial "to himself in consequence of the acts or delara- "tions of another, on which he had a right to rely, "equity will enjoin the latter from asserting his "legal rights against the tenor of such acts or dec- "larations; but then, the person charged has an "*opportunity* of *explaining*, and equity will *decree* "according to the *justice* of the entire case."

Branson *v.* Wirth, 27 Wall., 42.

"An estoppel, it is said, should be *certain* to "every intent, and therefore, if a thing be not di- "rectly and precisely alleged, it shall not be es- "topped. Co. Lit., 303*a*, 352*b*. * * * * "And with regard to the mode of using an estoppel, "it is said that it *it must be pleaded* if there be an "*opportunity;* otherwise, the party omitting to "plead it, waives the estoppel. See 2 Smith's Lead- "ing Cases, 457, and the authorities there cited."

Gilmer *v.* Pointdexter, 10 How., 391.

"An estoppel *in pais* does not operate in favor of "everybody; it operates only in favor of a person "who has been *misled* to his injury, and he only "can set it up."

Ketchum *v.* Duncan, 96 U. S., 666.

"An estoppel *in pais* is sometimes said to be a "*moral* question. Certain it is that to the enforce- "ment of an estoppel of this character, such as will "prevent a party from asserting his legal rights to "property, there must generally be *some degree of* "*turpitude* in his conduct which has *misled* others "to their injury. Conduct or declarations founded "upon ignorance of one's rights have no such in- "gredient and seldom work any such result."

Henshaw *v.* Bissell, 18 Wall., 271.

"It is difficult to see where the doctrine of equit- "able estoppel comes in here. For the application "of that doctrine, there must generally be some *in-*

"*tended deception* in the conduct or declarations of "the party to be estopped, or such *gross negligence* "on his part as to amount to *constructive fraud*, "by which another has been *misled* to his injury. "'In all this class of cases,' says Story, 'the doc- "trine proceeds upon the ground of *constructive* "*fraud* or of *gross negligence* which in effect *im- "plies fraud*. And, therefore, when the circum- "stances of the case repel any such inference, al- "though there may be some degree of negligence, yet "courts of equity will not grant relief. It has been "accordingly laid down by a very learned judge that "the cases on this subject go to this result only, that "there must be positive fraud or concealment, or "negligence so gross as to amount to constructive "fraud.' 1 Story, Eq., 391. To the same purport is "the language of the adjudged cases. Thus, it is "said by the Supreme Court of Pennsylvania, that "'the *primary* ground of the doctrine is, that it "would be a *fraud* in a party to assert what his "previous conduct had denied, when on the faith "of that denial others have acted. The element of "fraud is essential either in the intention of the "party estopped, or in the effect of the evidence "which he attempts to set up.' [Many cases cited.] "And it would seem that to the enforcement of "an estoppel of this character, with respect to the "title of property, such as will prevent a party "from asserting his legal rights, and the effect of "which will be to transfer the enjoyment of the "property to another, the *intention* to deceive or "mislead, or negligence *so gross* as to be *culpable*, "should be *clearly* established."

Brant *v.* Virginia Coal & Iron Co., 93 U. S., 335.

"No person can rely upon an estoppel growing "out of a transaction to which he was neither a "party nor a privy, and which in no manner touches "his rights."

Deery *v.* Cray, 5 Wall., 795.

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Supreme Court of the United States.

OCTOBER TERM, 1886.

No. 120.

HARRIS EAMES, *Appellant,*

vs.

WILLIAM D. ANDREWS, *et al., Complainants.*

BRIEF FOR APPELLANT.

C. R. INGERSOLL,
Counsel for Appellant.

122-40

Supreme Court of the United States.

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HARRIS EAMES, *Appellant,*

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BRIEF FOR APPELLANT.

C. R. INGERSOLL,
Counsel for Appellant.

Hoggson & Robinson, Law Printers, New Haven, Ct.

SUPREME COURT OF THE UNITED STATES,

OCTOBER TERM, 1886.

No. 120.

HARRIS EAMES, *Appellant*,

vs.

WILLIAM D. ANDREWS, GEORGE H. ANDREWS, AND NELSON W. GREEN.

BRIEF FOR APPELLANT.

This appeal is from a decree of the Circuit Court of the United States for the District of Connecticut, in a matter of certain Letters Patent of the United States reissued to Nelson W. Green, May 9, 1871, (No. 4372), for "an improvement in the methods of constructing artesian wells."

The original letters patent were issued to said Green January 14, 1868. (p. 67.)

The Bill is the ordinary Bill in Equity for an injunction and account. (p. 3.)

The Answer denies infringement and sets up in defence the invalidity of the reissued patent for want of novelty

and for not being for the same invention as the original. (p. 16.)

Final decree for an injunction was passed upon an opinion of Judge Shipman, filed February 8, 1883. (*Record, fol.* 161, *p.* 101.)

The appellant claims this decree to be erroneous in that it adjudges said reissued letters patent to be valid and the defendant to have infringed the same.

POINTS.

I. It is a vital element of the Green reissued patent that the well shall be formed by "driving" as distinguished from "boring," and so that by such "driving" the earth through which the instrument is driven shall be displaced laterally instead of removed upwardly, and in this manner made to compact tightly about the well-tube, above the water.

This reissued patent was construed by Judge Blatchford in *Andrews* vs. *Cross*, 8 Fed. Rep., 269. And this construction was adopted by Judge Shipman in deciding this case in the court below, and it is in harmony with the opinions rendered in prior hearings ~~upon~~ sustaining the patent in the Circuit Court, particularly of Judge Bene-

dict in *Andrews* vs *Carman*, 13 Blatch., 307, and of Judge Nelson in *Andrews* vs. *Wright*, 13 O. G., 969.

We will therefore assume it to be the construction of the patent claimed by the complainants here.

Judge Blatchford thus recites the invention described in the specification and secured by the claim: (p. 275.)

"The specification states that the instrument is to be driven down to the water, and the earth it meets with is to be displaced by it and thus packed around it, and not removed upward from it; that the tube, which is either to be inserted in the place where the instrument has been driven down, after such instrument has been withdrawn, or is to be itself driven down in the first place, is to be air-tight throughout its length, except at the bottom, where it has perforations to admit water; that these perforations are made for the purpose of obtaining a continuous flow of water; and that where the water does not flow out from the top of the tube without the aid of a pump, a pump is to be attached to the top of the tube by an air-tight connection. The specification contemplates the procuring of water. The process seems to be divided into two stages.

(1.) Making a hole for the tube down to water by displacing the earth by driving down a straight instrument into the earth, so that the earth is packed around the instrument.

(2.) Having in the hole thus made an air-tight tube, substantially as large as the hole, with a pump attached to the top of the tube by an air-tight connection."

The learned Judge then proceeds to show that the invention intended to be secured by the patentee was a *process of obtaining water from the earth*, composed of several steps and thus describes it: (p. 276.)

"The mechanical means are fully explained which result in the obtaining of the water, from the commencement of the driving. The process of obtaining the water comprehends all the steps which form part of that process as they result from or attend the mechanical means set forth. The process consists in having an air tight tube with the earth tightly packed around it, resulting from compacting the earth by displacing it by driving a rod or the tube, and having a pump attached at the top of the tube by an air-tight connection, and, by the operation of the pump, obtaining a supply of water at the top. In describing how the invention is made and used, so as to enable others to make and use it, the description includes driving the rod, putting in the air-tight tube, and having the pump, and obtaining a continuous supply of water."

But throughout the opinion, the learned Judge repeatedly and with emphasis states that it is "an essential element" of this process—"an inherent constituent" of it—that the "driving process" be employed to displace the earth laterally and thereby tightly compact the earth about the well-tube or pit.

And he cites approvingly the opinion of Judge Benedict in *Andrews* vs. *Carman*, who explicitly says:

"The novelty consists in making the well pit to consist of the tube of a pump *connected tightly* with the earth; this is accomplished *by driving into the earth* the tube to be used as a tube of a pump and at the same time as the pit of the well. *This manner of inserting the tube* renders it possible, by means of a pump attached to the tube, to create a vacuum in the pit of the well and at the same time in the water-bearing stratum of the earth."

And this was the construction claimed for the patent by

Mr. *Andrews*, the complainant in *Andrews* vs. *Hovey*, 5 McCrary, 181, as appears by the opinion of Judge Shiras.

And we understand it to be the construction claimed by the same witness in the present case. X-Q. 10 (p. 56). R. D. Q. 6 (p. 64.)

As the tight compaction of the earth by lateral displacement is the essential element of this patented process, the extent to which the "driving" step of the process is to be carried must, necessarily, be measured by the requirements of that element of the invention. A "driving" through any other material than earth that can be compacted tightly, or a "driving" through earth that will not, by its lateral displacement, produce this tight compaction cannot be the "driving process" intended by the patentee.

The patent speaks only of "ground" and "water." Before water is reached it is ground. After the water is reached it is water. When "water" is reached the well is produced.

"This invention consists in producing the well by driving or forcing down an instrument into the ground until it reaches the water, the hole or opening being *thus* made by a mere displacement of the earth, which is packed around the instrument and not removed upward from the hole, as it is in boring."

Judge Blatchford describes the driving as "down to water." (p. 275.)

Judge Benedict as "to a water-bearing stratum." (pp. 311, 321.)

Judge Nelson, "until it reaches a water-bearing stratum."

Indeed the specification would seem to require that *no part* of the hole in the ground should be made by "boring" or "sinking," or in any other way than by "driving." In describing the prior art of constructing artesian wells, it states:

"The method of constructing wells previous to this invention were what have been known as 'sinking' and 'boring,' in both of which the hole or opening constituting the well was produced by taking away *a portion* of the earth or rock through which it was made."

The implication that *partial* driving in the construction of bored artesian wells was old, is clear, and such, we shall hereafter see, was the fact.

It is not necessary for the defendant to consider or even attempt to comprehend the "new principle" affecting the flow of subterranean waters which it is claimed has been "put to practical use" in the construction of wells, by this process of displacing the earth laterally by "driving" instead of removing it upwardly by "boring."

That Mr. Green knew anything about it when he took out his patent is not supposed. Nor, as Judge Blatchford says, is this "why and wherefore," in any way material.

It is enough for the defendant to know that for the pur-

poses of his case, this "new principle" can only be utilized in one way, and that is the way already specified.

And it is the defendant's right to insist that he shall not be cast as an infringer without affirmative proof by the complainant that his wells have been constructed in this specified way, and no other.

II. The complainants have failed to prove infringement.

Manifestly, the burden of this proof is upon the complainants.

The entire evidence of infringement is comprised in the depositions of two witnesses—*Frederick B. Platt*, (p. 31), and *Daniel Clark*, (p. 35).

These witnesses testified Nov. 27th, 1880, to facts occurring in 1871.

The construction of the defendant's wells in 1871, and their use to the time of suit, was open and notorious. The complainants waited eight years before complaining of infringement, and not till nine years after the fact did they seek to prove it by the unaided recollection of those two men, who had been concerned in putting down a large number of other similar wells in the same locality about the same time.

Under these circumstances the complainants should be

held to strict proof of the facts claimed, and no doubts should be resolved in their favor.

We give the testimony of these witnesses in full. And we submit that it entirely fails to show that any portion of the defendant's well-pit was constructed by laterally displacing the earth so as to compact it tightly about the well-tube, above the water. For the question of infringement resolves itself into this.

On the contrary, the testimony shows that the well-pit was constructed by removing the earth upwardly by boring into the ground until water was reached, when the occasion for further boring or penetrating the ground ceased, and when it was clearly impossible by any "driving" or lateral displacement of the material which had been struck to compact it tightly in any way.

"FREDERICK B. PLATT sworn:

Q. 1. What is your name, residence, age, and occupation?

A. My name is Frederick B. Platt; my age is 57; residence, New Haven, and occupation—I call it farmer.

Q. 2. What was your occupation in 1870?

A. It was the same then; I had a few acres of land that I worked on.

Q. 3. State whether at any time you were engaged in the occupation of constructing wells; and, if so, during what years, and whether alone or with some other person, and if with some other person jointly, state with whom.

A. I worked with Mr. Daniel Clark putting down these wells; we commenced right away after we received

this assignment, on August 25th, 1870, and worked at it occasionally as we had orders for the wells; three or four years, I should think. We bought a right together and worked together.

Q. 4. Where did you put down these wells?

A. In New Haven county.

Q. 5. How many of these wells did you put down, according to your best recollection?

A. I don't know whether we put down a hundred or more, because I have no recollection of it.

Q. 6. State fully and particularly the process used by you in constructing these wells.

A. We had a hollow auger that bored a hole about three inches in diameter, with which we bored the hole *till we struck water;* then we coupled the pipe together, and either drove or pressed the pipe *into the water* below the strainer.

Q. 7. What do you mean by driving or pressing the pipe into the water below the strainer?

A. I mean by driving the pipe, striking it on top with a maul, and by pressing it; we put a chain on the pipe above, and used a lever with a purchase to push it down; *this was done after the hole was bored.*

Q. 8. How was your pipe constructed?

A. There were holes drilled through the pipe and a strainer inserted inside of the pipe up about two feet from the lower end generally.

Q. 9. State what, if anything, was attached to the lower end of the pipe.

A. A point screwed onto the lower end.

Q. 10. How far did you ordinarily drive or press the pipe?

A. From three to five feet.

Q. 11. Into what did you drive or press the pipe?

A. *Into wet sand.*

Q. 12. What, if anything, did you ordinarily attach to the upper end of the pipe?

A. Generally a No. 2 Douglas pitcher pump.

Q. 13. Do you know Harris Eames, the defendant in this case?

Yes, sir.

Q. 14. State whether you were ever employed by him to construct these wells, and, if so, when and where, and how many of them you constructed.

A. Daniel Clark and myself were employed by Mr. Eames to construct two wells in West Haven, First avenue, in the basement in a double house; I think it was in 1871—the date I am not sure about.

Q. 15. Who worked with you in constructing these wells?

A. Daniel Clark.

Q. 16. State where in the basements both wells were.

A. In the rear of the house; the partition ran through the center, and one was one side of it and one the other.

Q. 17. Did you construct them both at the same time?

A. Yes.

Q. 18. How was the house situated—east and west or north and south?

A. The house stands on a corner, I believe; facing the east, I think.

Q. 19. Are the basements on the north and south sides of the house or east and west sides of the house?

A. I should call them on the west side of the house—one on the north corner and one on the south corner.

Q. 20. Describe fully and particularly the process used by you in constructing these wells, specifying what difference there was, if any, between them.

A. I don't know as there was any difference from what I have described. *We bored a hole, as I said before, in the ground to the water, inserted the pipe, and either drove or pressed the pipe into the water from three to five feet, and attached a pump to the top—a pump constructed for a driven well, I believe.*

Q. 21. What do you mean by into the water?

A. *The water in the ground.*

Q. 22. You did not strike a solid body of water, did you?

A. I struck water enough to supply the pump; that was all we was after, generally.

Q. 23. Do you mean by into the water into the water-bearing stratum of the earth?

A. I suppose so.

Q. 24. What was your object in driving or pressing the pipe in the manner which you have testified?

A. To get a supply of water for the pump.

Q. 25. State whether or not a supply of water was furnished for the pump before the pressing or driving took place.

A. It was not.

Q. 26. How far or how deep did you bore for these wells before inserting the pipe?

A. We bored until we struck water; sometimes more and sometimes less.

Q. 27. State, if you can, how many, or about how many, feet you bored into the earth before inserting the pipe in constructing each of the two wells which you put down for the defendant.

A. I should think from twelve to fourteen feet.

Q. 28. In constructing these two wells, after removing the auger used in boring, state how many, or about how many, feet you drove or pressed the pipes in each of these wells into the water-bearing stratum of the earth.

A. About four feet, I should think.

Q. 29. State whether or not, after driving or pressing the pipes, as you have testified to, you removed any earth upward in constructing these wells.

A. No, sir.

Q. 30. State the manner in which you attached the pumps to the pipes in the defendant's wells.

A. With a coupling.

Q. 31. State whether or not you derived a supply of water from these two defendant's wells.

A. We did.

Q. 32. State, if you know, whether these wells, or either of them, have been in successful operation since their construction.

A. I don't know, sir.

Cross-Examined by MR. INGERSOLL.

C. Q. 33. You say that in constructing these wells for the defendant you bored till you struck water; how did you know when you had struck water?

A. *When we took out the sand it was wet when we struck water; before we struck it the sand was dry.*

C. Q. 34. Have you any particular recollection of these cases, enabling you to testify definitely on this point?

A. Yes, sir; *we always made a practice of striking water before inserting the pipe in the bore.*

F. B. PLATT."

"DANIEL CLARK sworn:

Q. 1. What is your name, age, residence, and occupation?

A. My name is Daniel Clark; I am 64 the 6th day of December; reside in Elm street, West Haven; occupation, farmer.

Q. 2. State whether or not you were engaged jointly with Mr. Frederick B. Platt in the construction of wells in New Haven county; and, if so, during what time.

A. I was, after Aug. 25, 1870; I could not tell how soon after; I was with him constructing wells for some three to four years.

Q. 3. Were the wells which you were engaged in constructing known by any special name; and, if so, what?

A. Well, I supposed according to the tube I bought it was a tubular well.

Q. 4. State whether you constructed, with Mr. Platt, any wells for the defendant; and, if so, where, how many, and when

A. I constructed two with Mr. Platt, for Mr. Eames, on First avenue, West Haven; I could not tell when it was, exactly; I think in 1870 or 1871.

Q. 5. Please describe fully and particularly the process used you in constructing the defendant's wells.

A. First we bored with a three-inch auger *down to water;* then we coupled the pipe together with the well-tube with the point on it, and then either drove it or pressed it down—I could not say which; I don't recollect —from three to five feet; probably about four feet; I could not recollect; sometimes we passed it down three feet, sometimes four feet, sometimes five feet; I could not recollect; we put on a Douglass pump; I could not say whether it was No. 1 or No. 2; we generally used No. 2 to it.

Q. 6. Please describe the construction of the bottom part of the tube you used.

A. It was one and a quarter inch pipe, with quite a number of holes drilled from an inch from the threads up two feet; the strainer was two feet long; then we lined it with fine wire cloth inside and perforated brass inside of that.

Q. 7. After driving or pressing the pipe, did you remove any earth upward?

A. No, sir.

Cross-Examined by MR. INGERSOLL.

X-Q. 8 In making these tubular wells, how did you know when you had reached the water by boring?

A. The auger would be wet and the sand that come up with it would be wet—*some little sand that come up.*

X-Q. 9. Did these appearances of water vary in different cases and in different localities—that is to say, would

the auger be more wet and the sand that come up be more wet in some cases than in others?

A. We had to bore in some places deeper to find water than in others, but when we came to water we always found some fragments on the auger to be wet—sometimes it would be a little bit of sand and sometimes a little bit of clay.

X-Q. 10. And would the evidences of water on the auger be generally the same?

A. It would, as a general thing, sir. *If you should dip a thing that was dry into a pail of water you would generally see the water on it.*

X-Q. 11. And did you generally look for such evidences of water before you stopped boring?

A. *I did, sir.*

X-Q. 12. Do you recollect whether this was so in the particular case of the defendant's wells?

A. *I do, sir.*

DANIEL CLARK."

Upon this testimony how can it be said that after the boring augur "struck water." there still remained a body of solid earth which, by driving the pipe through it, would be compacted so tightly around it and above the natural level of the water, as to produce the claimed conditions of a "driven" well as described in *Andrews* vs. *Cross?*

How can it be said that the material which the witness Clark describes as coming up when water had been reached by boring, was solid and not fluid? He describes it as water bearing sand, and not sand bearing water:

"The augur would be wet, and the sand that came up with it would be wet; some little sand that came up."

"If you should dip a thing that was dry into a pail of water you would generally see the water on it."

But whether earth bearing water or water bearing earth is of little consequence. Certainly it was not material that could serve the purpose of the claimed invention—that of being compacted tightly by lateral displacement and thus enabling Mr. Green's "vacuum" to be formed outside the pump-stock; this "vacuum" being something that would not be formed in case of a boring.

That a "water bearing stratum" was reached by the borer must be conceded.

The assumption that this stratum, (after water was reached), continued to be of earth capable of tight compaction by lateral displacement involves an absurdity.

It is described as a stratum of "sand," and, of course, permeable by water. And, manifestly, the stratum underlying and upholding this stratum of water-bearing sand, must have been of some material *im*permeable by water. The water-bearing stratum of sand, therefore, must have been full of water below the point where the water was struck. It is absurd to suppose, that, in *that* stratum, there could have been "ground" without water below that point.

"Water bearing strata" undoubtedly vary in the quantity of water they contain or are able to supply; but all are charged with that fluid in some quantity, and that quantity is always all they will hold; gravity will compel this. And in some strata the water lies in reservoirs, and

very large reservoirs. "The phenomena of Artesian fountains could not be explained without supposing it to be collected in large quantities and forming subterranean reservoirs of immense extent." (*Brande Enc. Tit. Art. Wells.*)

The patent indeed seems to regard the "water bearing stratum" as made up of these reservoirs of water, as distinguished from the solid ground which had to be penetrated to reach them. As already indicated it speaks only of "ground" and "water."

We submit that the facts thus proved bring the case entirely within the decision of Judge McCrary in *Andrews* vs. *Long*, 12 Fed. Rep. 871.

Judge Shipman, in his opinion, said: (p. 102)

"In this case, however, the witnesses, when they used the common expression 'struck water,' did not mean that they had reached an *adequate* source of supply for a well, but that they had reached a place where the presence of water manifested itself and where, by continuous excavation, an adequate supply would be attained. The wet sand or wet clay upon the augur showed that water was at hand. The well was then finished and a supply of water was obtained by pressing or driving a tube *into the ground* without removing the earth upward, and attaching thereto a pump."

Where is the evidence that a tube was "driven *into the ground*" (in the sense of earth that can be compacted tightly) after water had been struck? The witness *Platt* says the tube was driven "into the water" (p. 32.) The

witness *Clark* that the augur brought up water with "some little sand" (p. 35.)

And where does the patent require that the "driving process" (in the sense of a process by which *the ground* is perforated and compacted by lateral displacement) is to be continued until "an *adequate* supply of water is obtained? Its language is "until it *reaches* the water." To what depth below the surface of the water the point of the tube or rod shall be projected "depends upon circumstances," says the complainant *Andrews* (fol. 109, p. 61)—those circumstances being the quantity and quality of the water reached.

But such driving "below the surface of the water" cannot be "into the ground" or for any purpose of obtaining a tight compaction of the earth about the tube by lateral displacement. This effect would be impossible in a stratum permeable by water. & clearly unnecessary

The witness "thinks" the defendant's tube was pressed after striking water "from three to five feet;" but clearly it was not pressed into another and lower "water bearing stratum," than that in which the water was struck. The witness *Andrews* drops the tube "at least six feet" in the same stratum (fol. 109.)

Again his Honor says:

"A workman in our New England soil would not ordinarily be able to drive or press a tube into the *stony or tough crust* which must be penetrated before water bearing strata are reached, but it is no adequate argument

against infringement that it is necessary to bore or dig into the rough and hard soil or the mass of tough clay which lies over the sources of water supply provided, before a supply of water is reached, the patented process is thereafter used for the purpose of obtaining an adequate flow of water upon the surface of the ground."

But does this record disclose any such case as is here supposed? Where is the evidence that the defendant's wells were bored because the "stony or tough *crust*" which had to be penetrated could not be penetrated by driving? They bored to reach water not to penetrate a crust of earth. And where is the evidence that when this mass of crust was impenetrable by the driving rod had been passed here still remained *ground* "where no rock is to be penetrated" for the operation of the driver and the application of the patented process? If judicial cognizance is to be taken of the "New England soil," the common fact should not be ignored, that the sandy or gravelly plain, in which the city of New Haven, and the adjacent village of West Haven, (the locality of these wells), is situated, is singularly free of the obstacles to well-sinking suggested by his Honor.

We submit that infringement of Letters Patent cannot be proved by, nor ought a Court of Equity to issue its injunction upon, conjectures such as this.

III. Upon any construction of the reissued Letters Patent which can comprise the defendant's wells, the patent becomes invalid for want of novelty.

In other words the defendant's wells are constructed and operated in a manner well known in the art of well-boring long before the alleged invention of Green.

1. The patent to James Suggett, March 29, 1864, *Defendant's Ex. No.* 2, (p. 70), shows a method of "putting down and operating bored wells," which cannot be distinguished from that employed in putting down and operating the defendant's wells.

In fact the defendant's wells were put down by men claiming to act under the assignment of some patent right (p. 31, 34, fol. 60, 66) and it was probably this patent of Suggett's.

An invention in this Suggett patent was disclaimed by Green in his original patent of January 14, 1868, (fol. 122, p. 64.)

The complainant says that this Suggett patent has been declared invalid for want of novelty, (fol. 99, p. 55.) Very likely. Its method of constructing and operating wells was certainly old.

2. For example: *Defts. Exhibit, No.* 4, (p. 77) English

Patent to John Goode, for apparatus for boring earth for water, August 20, 1823, and the description of the same in *Defts. Exhibit, No.* 5. (p. 82,) "Repertory of patented inventions" published in London in 1827.

These publications show apparatus for "boring in clay and similar soils," (p. 78) for "forcing down cast iron pipes when the hole shall have been bored," (p. 79) (and it is noticeable that they are the same agencies referred to in Green's specification "a falling weight or other power,") and means for "raising the water when the water will not flow over the top of the well," (p. 84)—the latter publication stating, in reference to the means for raising the water:

"But it is evident that the use of these could be only temporary, as, without pipes of some kind, the hole would soon fill up; and, when pipes were used, it is obvious that they might be made to act as a pump by being furnished with pistons and valves."

In same connection see also *Deft. Ex.* No. 6.

And the process described in these Exhibits of constructing artesian wells shows that the wells so constructed must have had, at least in portions, the well-tubing in close and tight contact with the earth through which it had to be driven. The operation of the pump, therefore, must have brought into play the "new principle" of the patent, we hear so much of.

3. *Defendant's Exhibit* No. 10, (p. 86) *Brande's Encyc.*,

1843, describes very clearly every thing that was done in making the defendant's wells.

And with it see *Defendants' Exhibits* No. 7 and No. 11.

4. That "driving" in connection with "boring" is an old process in the construction of artesian wells appears by *Defendants' Exhibit* No. 7, (p. 84,) No. 12, (p. 86,) No. 13, (p. 87,) No. 14, (p. 88,) and the French Exhibits Nos. 15–19, (pp. 88–99.)

For the use of the "pump," in connection with "boring" and "driving," in France, see fols. 148, 154.

5. In *Defendants' Exhibit* No. 8, (p. 85,) an article from Ree's Cyclopedia, 1819, shows this construction of well. The ground is partially perforated by boring. A cylindrical wooden pipe is driven into this perforation downward, and the boring and driving continued until water is reached —the earth filling the borer being drawn up and cleared. This process, it is stated, may be continued to any stratum or "sheet of water" desired, and when the "lower sheet of water" is reached, "*it will rise in the cylindrical tube in a pure state into the body of the pump fixed for the purpose of bringing it up.*"

The complainant, Andrews, when testifying in this case was interrogated as to a similar construction to this. *See testimony X-Q.* 33–39, (*pp.* 58–59,) *and 2d. R. D. Q.* 1, (*p.* 65.) And he gave it as his opinion, that if, in a well so constructed, the water should rise and overflow, there

would be no infringement of Green's patent. But if the water should not rise and overflow, and a pump should be attached by "an air-tight connection," and water obtained therefrom by the operation of the pump, "*a well so constructed and operated utilizes the discovery of Col. Green, operates upon the same principle, and is, as I claim, a complete equivalent, and when finished and operated, is substantially the same thing.*"

That any pump so connected, to be operative as a pump, must have its connection air-tight—that is, must not leak—the witness admits (fol. 114.)

But if the construction and operation supposed by the witness is the complete equivalent of the patented invention, the construction and operation described in this exhibit, must be a complete anticipation of the development of the "new principle" claimed.

IV. The reissued patent is invalid as not being for the same invention as the original.

We still assume for the claim of the reissued patent the construction given to it by the Circuit Court and defined, as we have shown, by Judge Blatchford, in *Andrews* vs. *Cross*.

By this construction (8 Fed. Rep., 276,) the claim of the reissued patent is for *a process of obtaining water from*

the earth, comprising the four distinct steps (1,) "driving the rod;" (2,) "putting in the air-tight tube;" (3,) "having the pump;" and (4,) "obtaining a continuous supply of water."

And the process is described generally as:

"Not merely the displacement of the earth by driving down the instrument or the tube, but is, in addition, having the *air-tight tube* in the earth *with the earth packed around it*, and a process arranged, by the *mechanical aid of a pump*, attached by an *air-tight* connection to the tube, for causing the water to enter the perforations at the lower end of the tube, and issue from the upper end of the tube."

And it is said not to be complete, (in a non-flowing well,) until by a mechanical operation of the pump the water is caused to enter and issue from the well-tube as just stated. So that any person using the pump, with that result, uses the process of the patent, and by so using it, without license, becomes an infringer of the patent (p. 277.)

And this process, (as construed by the court below,) may be used, although the ground through which the well is formed may not be, ground "where no rock is to be penetrated," but may be (certainly partially if not substantially) of material that cannot be penetrated by a driving rod.

But this was not the invention claimed by the original patent.

The claim of the original patent was, (p. 70):

"The herein described process of sinking wells, where no rock is to be penetrated, viz., by driving or forcing down a rod to, and into, the water under ground, and

withdrawing it, and inserting a tube in its place, to draw the water through, substantially as herein described."

The whole invention is here clearly specified and described. "The herein described process," is defined by the *videlicet*, as consisting of two steps, (1,) driving down a rod to water, (2,) inserting a tube in place of it, to draw the water through. And there is not a word in the previous text of the specification justifying any more expanded construction. Indeed that specification is, if anything, more specific.

"My invention consists in driving or forcing an iron or a wooden rod, with a steel or iron point, into the earth until it is projected to, or into, the water, and then withdrawing the said rod, and inserting in its place a tube of metal or wood, to the same depth, through which, or from which, the water may be drawn by any of the usual, well-known form of pumps."

The process here described is a process for "making a well *where no rock is to be penetrated.*"

The patentee was undoubtedly aware of the old processes, described in *Defendant's Exhibits*, Nos. 4, 5, and the numbers before referred to, by which artesian wells had been constructed, in ground where "rock," or "stony crust," or masses of "tough clay," had to be penetrated by augers and special tools, and where these tools had been operated, by driving, in connection with boring.

He intended to disclaim all such processes as he, ex-

pressly, did disclaim the process to which the Suggett auger, tube and pump was adapted.

And he intended to limit himself to the process of sinking wells only in such soils as could be penetrated by a rod the entire depth from the surface of the ground to the water under the gronnd, and which did not require a boring-tool in the work of such perforation and construction.

This process was complete when the perforation had been made by one driving to water of the rod, and the insertion of the tube in the place of the withdrawn rod. The well is then made.

And this was the claimed novelty, which distinguished it from the artesian wells so well-known.

There is not a suggestion in this specification that by this method of constructing artesian wells, any more copious or better supply of water can be obtained from the well, when completed, than will be obtained from wells made in the same ground, by the boring-tool, or the older methods.

Nor is there a hint that it is necessary for the operation of such wells, according to the patent, that the tube shall be "air-tight," its whole length, and, when inserted, shall have the ground tightly compacted about it, and shall be connected with a pump by an "air-tight connection," so that, by this operation, a "vacuum" will be produced somewhere, and a "new principle" in subterranean hydraulics be developed somehow.

The only allusion in the description of the claimed in-

vention to any process for obtaining water from wells, constructed by the patented process, is this:

"Any suitable, well-known pump may be applied to raise the water up through the tube to the surface, or admit it."

And then follows the disclaimer of the Suggett patent, which shows a pump attached to the boring-tube.

This suggestion of any "suitable, well-known pump," would comprehend the "lifting-pumps," used by Goode, *Defts. Ex.*, 4, 5. But it was clearly not intended for a description of any part of the process claimed, and the claim immediately following ignores it, and states the described process with the insertion of the tube "*to draw the water through.*"

Now, to change this original patent for a process for *making a well*, comprising *two* steps, into a patent for a process for *obtaining water from the earth, by means of certain mechanical arrangements, in addition to the mere construction of the well*, and comprising four distinct steps, required a very important change to be made in the original specification and claim, and, consequently, an important introduction of new matter into the reissued specification.

And, accordingly, we find that from an "improvement in the manner of sinking and constructing artesian wells, where no rock is to be penetrated," in the original patent, the invention becomes, in the reissued patent, "an improved method for constructing artesian wells,"

whether rock is to be penetrated or not; giving to the character of the invention the difference condemned by by this court, particularly in *Russell* vs. *Dodge*, 93 U. S., 460.

And to carry out this object it became necessary to interpolate into the description of the invention, that the opening to be made by the rod must be so made that the earth which is displaced will be "*packed around the instrument*" and then that the tube which replaces the rod must be "made air-tight *throughout its length*," and when the aid of a pump is necessary, it must be attached to the tube "*by an air-tight connection.*"

And without these changes in the specification it would have been impossible to give to the claimed invention the construction it has received in the Circuit Court. We can add nothing in this respect to the opinion of Judge Shiras in *Andrews* vs. *Hovey*, 5 McCrary, 181.

But it is very clear that the patentee, when he applied for the original patent, did not "attempt to secure" any such invention as that required by this construction of the reissue. If he was the discoverer of those mechanical means by which the "new principle" of Green of "forcing the water in the water-bearing strata of the earth from the earth into a well-pit by the use of artificial power applied to create a vacuum in the water-bearing strata of the earth and at the same time in the well-pit," (*Andrews* vs. *Cross*, p. 277), it is very certain that *that* was not the invention for which he attempted to secure the original patent of Jan. 14, 1868.

He may have been ignorant of the "new principle." But he was bound to know the "means" of "putting it to practical use" for which he claimed the reissued patent if they were then of his invention. And knowing them when he applied for the original patent it was his duty to make them the subject of his application if he intended to secure them by the patent. It is impossible that he should have omitted to do so by any mistake of error or inadvertence. And that is the case of *Powder Co.* vs. *Powder Works*, 98 U. S., 126, which has now become the settled law of reissues—where it is declared that the statute of reissues gives no right to a patentee "to patch up his patent by the addition of other inventions, which, though they might be his, had not been applied for by him, or, if applied for, had been abandoned or waived. For such inventions he is required to make a new application, subject to such rights as the public and other inventors may have acquired in the mean time."

James vs. *Campbell*, 104 U. S., 356.
Eachus vs. *Broomhall*, 115 U. S., 429.
Wing vs. *Anthony*, 106 U. S., 142.

What there was of patentable novelty in the device (in a tubular well reaching from the ground surface to water) of making the well tube "air-tight throughout its length," or of attaching the pump to the well-tube by "an air-tight connection," or of tightly packing the earth about the

well tube, and how, by means of these devices any other "vacuum" will be produced by the operation of such a pump than that which has always been produced in the pipe of a suction pump ever since the operation of such a pump was known we confess our inability to see.

Nor can we see what there is in the specification of this patent upon which to base the construction we are now assuming—particularly after the disclaimer (during the application for the reissue) of the claim for the attachment of a pump to the tube "by an air-tight connection." (*Fol.* 131, *p.* 77,) *U. M. Cartridge Co.* vs. *Cartridge Co.*, 112 U. S., 624.

But if the complainants can convince the Court otherwise, and that "a new principle" in the flow of subteranean waters by these devices developed, and that Green was its original and first discoverer, the clearer does it become that he had no conception of any such discovery when he applied for his original patent, or he could not have failed, by at least some suggestion or intimation in its specification, to manifest his intention to claim the means of putting such a novel discovery into practice.

And even if the specification of the reissued patent had not been vitiated by its "new matter," the expansion of its claim which we have noticed, after the delay of over three years, would be sufficient to invalidate the reissue upon the now well established rule in that respect.

V. Upon any construction of the reissued patent limiting it to the invention claimed in the original patent, the defences of the defendant must prevail.

The invention of the original patent relates only as we have seen, to the process of sinking wells where no rock is to be penetrated: and that process is by driving a rod down to water, withdrawing it and inserting a tube in its place to draw the water through.

1. If the defendant's wells were sunk in soil which could not well be penetrated by a driving rod, as the court below would seem to suppose, the conditions of this invention were clearly not present.

2. If, on the other hand, these conditions were present, then as clearly, the defendant's wells were not sunk by the process described. The defendant's wells were bored wells in the common sense of that term as used in the art of well sinking, as shown by the Defts. Exhibits.

3. But in either case such a process is without patentable novelty in view of the state of the art appearing by *Defendants' Exhibits.*

"Driving" as a process in sinking wells was well known in conjunction with "boring." And the insertion of a tube in the perforation formed by boring and driving, for the

purpose of drawing water through it by a pump was also well known. *Defendants' Exhibits* 4, 5, 6, *et seq.*

And "driving" simply in soils where no rock is to be penetrated is shown, particularly, in *Defendants' Exhibits* Nos. 7, 13.

Nor can there be anything of patentable novelty in a process for perforating the earth by *piercing* instead of *boring*.

VI. The laches of the complainant disentitle them to relief.

It is cases like the present that have given this Green patent its ill-repute in the country.

The defendant's wells were put down by him innocently at the instance of parties claiming to be working under a patent right to whom the defendant fully accounted. And they were put down as "tubular," not "driven" wells.

This was in 1871.

The wells were put down openly, and have ever since been used openly.

The complainants waited eight years before notifying the defendant of any claim upon him, and then this suit was brought. *Fol.* 65, p. 34.

Sullivan vs. *R. R. Co.*, 94 U. S., 806.

C. R. INGERSOLL,
of Counsel for Defendant.

172-40

Supreme Court of the United States,

OCTOBER TERM, 1886.

No. 120.

HARRIS EAMES,

Appellant,

vs.

WILLIAM D. ANDREWS, GEORGE H. ANDREWS and NELSON W. GREEN,

Appellees.

Appeal from the Circuit Court of the United States for the District of Connecticut.

BRIEF FOR APPELLEES.

J. C. CLAYTON,
Counsel for Appellees.

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1886.

U. S. Supreme Court.

OCT. TERM, 1886.

HARRIS EAMES,
Appellant,

v.

WILLIAM D. ANDREWS, GEORGE H. ANDREWS and NELSON W. GREEN,
Appellees.

No. 120.
Appeal from U. S. Circuit Court for the District of Connecticut.

Brief for Appellees.

This is an appeal from a final decree of the Circuit Court of the United States for the District of Connecticut; that decree sustained the validity of what is generally known as The Green Driven Well Patent, Reissue No. 4,372.

That patent has been sustained, after vigorous contests, in the following cases:

1. Andrews *v.* Carman, Judge Benedict, 13 Blatch., 307.

2. Andrews *v.* Wright, Judges Dillon and Nelson, 13 O. G., 969.

3. Hine *v.* Wahl, Judge Gresham. No opinion.

4. Andrews *v.* Cross, Judge Blatchford, 8 Fed. Rep., 269.

5. Green *v.* French, Judge Nixon, 11 Fed. Rep., 591.

6. Andrews *v.* Creegan, Judge Wheeler, 7 Fed. Rep., 477.

7. Andrews *v.* Eames (this case), Judge Shipman, 15 Fed. Rep., 109.

The case of Hine *v.* Wahl was fully argued on appeal in this Court (No. 70, Oct. Term, 1882), and the patent *sustained* by a divided Court, no opinion being written. Of course, counsel who argued that appeal, for the patent, cannot know the point on which the Court divided, but they have always believed that it was because of a defective record, not entirely clear on the question of *infringement*.

8. The patent was also construed and sustained in concurrence with the opinions of Judges Benedict and Blatchford, by Judge McCrary in the case of Andrews *v.* Long, 12 Fed. Rep., 871, but the bill was dismissed because of non-infringement.

9, 10. In the case of Andrews *v.* Cone, and Andrews *v.* Hovey, (16 Fed. Rep., 387), the patent was defeated; Judges Love and Shiras; in those cases Judge Nelson filed a dissenting opinion sustaining the patent; the defendants' proofs in these cases were substantially identical with the proofs considered and overruled in several of the earlier cases. Andrews *v.* Hovey, and Andrews *v.* Cone are now on appeal in this Court, Nos. 196–440.

The cases of Green *v.* French, and 10 other cases tried together, and appealed to this Court, were dismissed, last term, upon stipulation, the defendants settling the decree below. A few days ago the same action was taken in the case of Andrews *v.* Creegan, all these cases having been appealed by defendants below.

The answer sets up 28 patents alleged to anticipate the patent in suit; also, 53 prior printed publications; also, 222 persons are named who are alleged to have had prior knowledge.

But 2 of these prior patents (Goode's and Suggett's) are in evidence; extracts from 17 only of the prior

publications are in evidence; and *not one* of the 222 persons was examined as a witness.

The only defenses urged at the trial below were:

1. Non-infringement.

2. Prior publication and patent.

3. The reissue question—expansion and delay.

In the previous cases (as appears by the opinions of the several courts), many other defenses were made and overruled, and many witnesses were examined to show abandonment, prior public use in this country, etc. This defendant apparently deemed these defenses futile, and did not support them by proofs.

The only *errors assigned* in the decree are:

1. That the decree held that defendant had infringed.

2. That the reissue was valid (Appellants' Brief, 2).

It will be convenient to consider the case in the following order:

I. The invention.

II. The patent, and its construction.

III. Infringement.

IV. Prior patents and printed publications.

V. *Laches* in bringing suit.

VI. The reissue question.

I.

The Invention.

Before the invention of Col. N. W. Green, the grantee of the patent in suit, "wells" were made in two ways. The most usual was the "dug well," which was a mere *pit* dug into the earth to such a depth that water rose into its bottom to a height equal to the level of the water in the surrounding earth. Such wells were usually walled up with stone, brick, boards, or otherwise, and were most usually about three feet in diameter for domestic uses. The *force of gravity only* caused the water to flow into these wells. The water from such a well was removed by buckets or other simple lifting device, or by a pump, the pipe or "stock" of which was very much smaller than the diameter of the well pit, and which extended below the surface of the water. When the pump was operated, a *vacuum* was created in the pipe, and the pressure of the air on the *surface* of the water in the well pit *outside* of and around the pipe caused the water *in* the well to rush into the *vacuum* in the pipe, and follow the piston to the point of delivery.

In such a well, the action of the pump at each stroke merely lifted a portion of the water contained in the bottom of the well pit, but exerted no power towards compelling any water in the surrounding earth to enter the well pit; the pump acted on that water only, which at the time of each pump stroke was actually contained within the well pit itself.

Wells thus made have been known since prehistoric times; pumps thus operating in such wells, since the days of Archimedes.

The other kind of "wells," though different in the manner of making, were identical in operation when made, except when they were flowing wells. These were commonly called "artesian wells;" and they were made by *drilling* or *boring* (instead of excavating with pick and shovel) to the desired depth. Usually this drilling or boring went to

hundreds or thousands of feet through rock, clay, sand, and many different strata until the water *flowed* out at the top of the well.

In these wells (just as in the older *dug* wells) the "material" which had occupied the pit thus made, was removed, or *excavated;* the main difference being that, instead of pick and shovel to break up or comminute, and remove the "material" (rock, earth, etc.), as used in making a dug well, the "material" was broken up, by "drills," "augers," "borers," and other like tools, and was removed or excavated by means of *buckets*, sand pumps, etc. These artesian wells were commonly lined with a metallic tubing usually six inches or more in diameter. Sometimes the rock through which such a well was drilled or bored, was so close grained that the *lining* of metal or wood could be omitted. Sometimes *gravity* from an elevated head of water, would force the water up out of the top of the well pit thus made, and result in a "flowing well." But when the water did not flow a pump would be attached to a suction pipe extending down into this artesian well pit in the same manner as in a dug well and draw out, stroke by stroke, a certain portion of the water which had been forced by gravity into the well pit. The pump had no effect upon compelling the water to enter the well pit; it merely drew out that which had previously entered.

Wells, or methods of getting water from the earth, by these means, had invariably these characteristics:

1. The earth, rock, etc., was *excavated*, or removed *upwards*.

2. The water entered the well-pit by mere force of gravity.

3. When all the water within the well pit within reach of the vacuum was removed, as by rapid pumping, the pump ceased to deliver water until

gravity had time to force in enough more water to respond to its action.

4. The suction tube was carried down *within* the well pit; and was *not itself* the "well pit."

5. Between the pump tube and the walls of the well pit there was always, and necessarily, space for air to pass down and press upon the surface of the water in the well pit.

Colonel Green discovered that

1. *Excavation* was not needed.

2. That a "well-pit" was not needed.

3. That the *pump tube itself* would take the place of a well-pit.

4. That instead of *excavating*, a better well could be made by *puncture*.

5. That when made by *puncture*, the pump-tube was put into close *contact* with the water-bearing stratum of the earth.

6. That the effect of such close contact *between the water bearing stratum and the pump tube* was to dispense with any independent reservoir or well-pit (as was necessary in all previous wells), substituting therefor the entire water bearing stratum with which the openings were in direct contact and compelling a supply, so long as any water was contained in the entire stratum above the level of the openings into this tube, thus furnishing not only a cheaper well, but a better and practically inexhaustible supply of filtrated water beyond the reach of surface contaminations.

Whether or not Colonel Green fully understood the "*philosophy*" *or scientific principle*, involved in the construction or operation of his invention and discovery, is wholly immaterial. He certainly invented, described and patented the invention de-

scribed; and aftercomers have studied and explained the scientific *rationale* of its operation.

The only expert in the art of making pumps and wells examined in the case states the philosophy clearly (Rec., 62-64).

Cross-examination [of complainant's expert]:

"1xQ. (By Mr. Hamilton.) How many kinds of "wells are there?

"A. In general terms there are three kinds.

"2xQ. Name them?

"A. Open dug wells, walled, boarded or other- "wise lined; Artesian wells, drilled and bored and "usually lined, except in rock strata, and driven "wells, as set forth in the specifications of the Let- "ters Patent in suit.

"3xQ. How is a bored well made?

"A. Made by the use of drills, chisels, augers and "a great variety of auxiliary tools by which an open- "ing is made into earth down to water and the ma- "terial displaced taken to the surface; it is usual in "making Artesian bored wells to drive down a wood- "en or iron pipe, open at both ends, having a sharp "edge around the circumference of its lower extrem- "ity, which pipe is usually driven to rock, the earth "being taken out from within it; as the driving pro- "ceeds and after it reaches the rock, chisels, drills "&c., are used to disintegrate the rock which is taken "to the surface through the tube so driven.

"4xQ. Are they sometimes made by boring with "an auger or other instrument down to the water, "and then the tube driven down from the surface of "the ground?

"A. The accounts of making Artesian wells show "that in some instances *boxes* are driven down in "lieu of the tubes, but they are in effect, themselves "tubes; *but are not the tubes through which the* "*water rises to the surface of the ground;* a tube of "some kind being a necessity, to prevent the caving "in of the sides of the opening.

"5xQ. Is the tube always a necessity where the "boring does not terminate in rock or some hard "substance?

" A. It is, including clay or like material.

" 6xQ. Is the boring in some cases carried as far as " desired before the tube you have mentioned as " necessary is inserted or driven down ?

" A. Not to my knowledge; the use of the tube be- " ing to keep back the earth ; unless the walls of the " excavation were of rock, hard clay or similar mater- " ials, the boring could not be made to water with- " out the sides being in some way supported, and it " is usual, if not invariably the custom to drive " down open ended pipe to the rock as a commence- " ment.

" 7xQ. When this is done, is this pipe allowed to " remain as a lining for the well ?

" A. Usually it is; in former times it appears not " always to have been ; I have reference now to the " boxes described which are in reality tubes in a " square form.

" 8xQ. In your direct examination you speak in " reference to the Defendant's Exhibits, of boring, " and emphasize that expression; does it (boring) " necessarily in all cases mean a removal of earth " upwards ?

" A. It does in all cases I have read."

Re-direct-examination :

" 5Q. * * * Will you explain the difference " between the operation of these different kinds of " wells ?

" A. Water is supplied to open dug wells only by " the force of gravity, and when the water is pumped " from them by the ordinary suction pump, the " pressure of the atmosphere is the same on the sur- " face of the water in the well as it is upon the " water in the earth surrounding it, and the result " is that the water in the well itself, being in free " space, is more readily forced by the pressure of the " atmosphere into the suction pipe of the pump " than the surrounding water, which is retarded by " friction through the earth, and, in consequence, " the continued operation of the pump soon ex- " hausts the water in the well, which supply can

" only be replenished by the action of gravity; the " pressure of the atmosphere to retard its flow into " the well being equal to and counterbalancing the " pressure exerted by the atmosphere upon the sur- " face of the water in the earth, and the operation " of the pump has no effect upon the water in the " surrounding earth to force it into the well, hence " the supply to the open dug well is due to and pro- " duced only by the action of gravity."

"In the Artesian well, the same principle govern " in regard to the means of supply, when they are " not flowing wells; but in consequence of such wells " being usually inserted down into rock or like sub- " stance, until they meet with open fissures in the " rock, through which water flows more freely and " readily than it does through ordinary compacted " earth, sand, etc., which form the water bearing " strata above the rock, a much larger quantity of " water is obtained therefrom, in proportion to their " diameter, than is usually obtained from the dug " well, unless, as in some cases, the dug wells are " carried down into a rock stratum and strike a " similar seam in the rock. When Artesian wells " are flowing wells, the generally received opinion " is——

(Objected to.)

" ——that their supply of water comes from a water " bearing stratum, lying beneath a stratum practi- " cally impervious to water, but which lower stratum " extends beyond and crops out at the surface of " the earth, at a greater or less distance from the " well itself (often many miles away), and at a con- " siderably higher elevation than the surface of the " earth at the well.

"The distinguishing characteristic of a driven " well, as it differs from the dug well, is, that when " the pressure is relieved from the interior of the " tube which itself forms the body of the well, not " only does the force of gravity act to supply it with " water directly from the earth, but there being no

"intervening body of water between the wall of the "well itself and the earth surrounding it, upon "which the atmosphere can act directly and with "greater effect to force it into the well (as it can "and does in the open well), the water is supplied "directly to it, from the earth surrounding it, in a "direct inverse ratio to its distance from the well; "and the friction of the water through the earth be- "ing directly as the square of its velocity, as the "distance from the well increases, the water moves "very much slower than it does immediately next "to the well itself; but the area of the source of "supply being increased exactly in the ratio of the "square of its distance from the well, and the fric- "tion being increased exactly as the square of the "velocity (in any given stratum), the one exactly "counterbalancing the other, it follows that, from "natural laws, the surface of the water in the earth, "surrounding the well, is and must be maintained "practically at a given level; whereas, in the open "well, supplied by gravity only, the water in the "earth inclines from the natural surface of the "stratum in the earth to the bottom of the well, "the angle of that decline decreasing as the supply "is taken from the well, and unless pumping is "stopped, and time allowed for a re-supply, the "lowering of the water in the earth extends to a "continually increasing distance and a longer time "is required to obtain the original quantity in the "well; while the supply to the driven well is con- "tinuous and steady, and practically inexhaustible, "the supply in a given time being proportioned in "any given soil to the size of the pipe forming the "well, having openings proportionate to its size; "different wells varying in the supply, according "to the nature of the soil in which they are inser- "ted, but remaining virtually constant at all times "in the same soil; it is not claimed, nor is it a fact, "that water can be pumped from a Driven Well, in "any given stratum, with greater ease than from "an open well sunk into the same stratum, but the

"great advantages are, that a much larger and "more extended supply of water is controlled, and "in consequence of the passage of the water through "the earth, under the pressure of the atmosphere, "a constant filtration is secured, thus securing "both a greater supply and better water; and "where large and continuous supplies are obtained "by unintermitted pumping, for days and weeks "at a time, experience has shown that the quan- "tity of water has gradually but perceptibly im- "proved, as in the case of the wells at Bellville, "heretofore mentioned, where an amount of water "is obtained largely exceeding the rain fall upon "the entire territory not shut out from the valley "by outcropping rocks upon three sides and open "to salt water upon the fourth, and no practical "diminution of the height of the water is observed.

"One peculiar characteristic of a Driven Well, "as distinguished from the bored Artesian Well, "is that the Driven Well is for use in soil where "no rock is to be penetrated, and where the pres- "sure of the atmosphere is free to act upon the "surface of the water in the earth surrounding it, "while the Artesian well is usually, if not always, "bored into a rock stratum, and is supplied with "water through fissures in the rock, instead of "through the earth itself surrounding the entrance "or opening to the well."

These facts warrant the appellees in claiming that Col. Green was the first to do three things:—

1. He was the first to *discover* the specific fact or principle *that if a pipe with an opening at the lower end be placed tightly in the earth, extending down air tight till it reaches into water, and having a pump attached, air tight to its upper end, and the pump being operated, tending to produce a vacuum in the pipe, water will flow freely through the earth into the pipe, abundantly and continuously supplying the pipe and pump, and constituting a practical and productive well.*

He also *discovered* the supplemental fact or principle that such a well would yield *more* water continuously than the open well.

2. Col. Green, in addition to this *discovery* of the *principle*, actually produced an *apparatus* embodying and utilizing the said discovery; that *apparatus* being the assemblage, arrangement, and construction of parts commonly known as "a Driven Well." In other words, a "Driven Well" is an *apparatus* for procuring a supply of water from the earth, and *each unauthorized pump stroke of such an apparatus which yields water is an infringement.*

Considered as an *apparatus* the Green well involves the following combination and arrangement: 1, There must be a pipe in the earth; 2, the lower end of the pipe must be in the water bearing stratum, and be open wholly or partially; 3, that pipe must constitute the lining of the well; 4, on the upper end must be a pump; 5, the pump must be "applied" tightly to the pipe; 6, the pipe must be air tight at all places between the water stratum and the delivery of the pump.

3. In addition to the *discovery of the principle*, and the *construction of the apparatus*, Col. Green *invented a new mode or process*, whereby he cheaply *constructed the apparatus*, and *utilized the discovery*. And this process, which is purely mechanical, was a cheap and quick *mode* of *placing the tube in the earth*; that is, by *driving* or forcing the rod or *tube* into the earth by *puncture* instead of by drilling or excavation.

This mechanical method naturally led to the name *Driven Well*—and careless observers (many eminent counsel among them), supposed that *actual driving* was the *sole* thing *discovered* or *invented* by Col. Green, having been misled by the restrictive popular name adopted for convenience. If the invention had been originally styled "Green's Well," much misapprehension would have been avoided.

Viewing Col. Green in this light, he

1. *Discovered a principle.*
2. Described a process for utilizing that principle.
3. Described and used a means of performing the process which includes the use of equivalents; and therefore his patent should be held to be commensurate with the three things which are included in his great gift to the world—the Driven Well.

This Court will remember that during the argument of Wahl *v.* Hine, we illustrated the *principle* of Green's invention by an apparatus, placed in the corridor below:—as follows:

We procured a box about four feet in length, two feet in width, and three and a half feet in depth; into one end of the box was placed a cylinder of perforated brass, six inches in diameter, and nearly the depth of the box; we then filled the box to the depth of about 30 inches with sand, outside of and around the cylinder so placed (which was about six inches from one end of the box), filling the entire box, except the inside of the cylinder, to the depth named, with sand; the cylinder so placed represented an open well lined with perforated brass from top to bottom, so as to permit the water which was poured upon the sand until it was saturated and a small amount left standing on the surface of the sand, to enter the well through its entire surface from top to bottom. We then took two small hand pumps of precisely the same style and make, attached the working valve rod of each pump to a working lever equidistant from its center, which was pivoted to a stationary upright, and to each of the pumps we attached an iron tube of the same size, having each at its lower end a point—technically so called—six inches in length, made of perforated brass of the same character, size, and number of openings to the square inch as was the lining of the open well as described; in the bottom of each of these points, as described, was a metal point, fastened, and the upper end of each perforated point was attached to the lower ends of the

respective tubes, each pump tube and point being a perfect facsimile of the other; we then had these pumps attached to a single plank, through which their suction pipes passed downwards; we then inserted simultaneously the one tube into the open well, which was filled with water and contained no sand, and the other directly into the solid sand, at the same distance from the other end of the box as was the center of the open well from its end of the box; we then operated the pumps simultaneously, each having the same stroke and capacity; in about one minute all the water in the open well was pumped out, the water from both pumps being discharged back upon the sand, insuring a full supply to each well, according to its capacity; after emptying the open well, the pumps were continued in operation; the one having its pipe tightly inserted into the sand saturated with water, was continued in operation for several minutes without the least apparent diminution in the amount of water it delivered, while the pump in the open well did only deliver an occasional spoonful after the well had been first emptied, as before stated, in about one minute; the pumping was continued until the judge remarked that it had been long enough continued to show its inexhaustibility.

More fully to exemplify the principle that the atmospheric pressure forced the water directly from the sand into the vacuum formed in the tube inserted into the sand, and that the surrounding of the tube in the water bearing stratum by the earth compacted about it was the cause of the greater delivery obtained from a driven than from an open well, in consequence of the insertion of that tube into the earth; we then, without making any change whatever, either in the pumps, pipes, box or lining of the open well, filled the open well with sand, which was compacted tightly around the tube up to the level of the other sand in the box outside of this well; the only real difference then existing between the two pumps, pipes and wells, being that

the pipe in the open well was, while surrounded with the sand compacted against it, still further surrounded by the perforated brass, through which and from which the pump, with its pipe in that well had only received a supply, which, coupled with the amount of water standing in the well itself, supplied the pump for but one minute; we then again commenced operating the pumps, and the supply from each was continuous and equal; this operation was continued until the Court appeared to be satisfied that the filling up of the open well had increased its capacity, and made it equal in delivery to the first driven well.

It is neither needful nor convenient to repeat that illustration.

II.

The Patent and its Construction.

Appellees rely upon the construction given by Judges Blatchford, Benedict, McCrary, Shipman, and others.

The appellant, too, adopts the construction given by those judges (Appellants' Brief, p. 2).

Regarding the reasoning in support of that construction as cogent, we, for the sake of convenience, make quotations at some length.

Judge Benedict says: "This well *embodies an* "*idea not present in any other form*, namely, that "the water in the water bearing stratum of the "earth may, by the application of artificial power, "be forced to flow from the earth into the well pit, "with increased rapidity, so that a well pit only a "few inches in diameter, sunk to a moderate depth, "will afford an abundant supply of water and con- "stitute a practical and productive well."

"The characteristic difference between the driven "well and other forms is in the practical applica- "tion of this new idea."

"In previous forms the rapidity with which water "flows from the earth into the well pit is depend- "ent upon the natural forces as they happen to be "found operating upon the water lying in the "water bearing stratum to which the well pit is "sunk."

"The driven well adds artificial power, so applied "as to cause a great increase in the rapidity with "which water in the earth will flow from the earth "into the well pit. The foundation of this new "form of well is the discovery that if a pipe with "an opening at the lower end be driven into the "earth, extending down air tight until it reaches "water, and have a pump attached air tight to its "upper end, and a vacuum be created in the pipe so "fitted and connected with the water in the earth, "water will flow abundantly from the earth into "the pipe.

"*The novelty consists in making the well pit to "consist of the tube of a pump connected tightly "with the earth*; this is accomplished by driving "into the earth the tube to be used as a tube of a "pump and at the same time as the pit of the "well.

"This manner of inserting the tube renders it pos- "sible, by means of a pump attached to the tube "to create a vacuum in the pit of the well and at "the same time in the water bearing stratum of the "earth.

"The difference between the new process under "consideration and the old, is that the pressure of "the atmosphere, which in the ordinary well "operates at the sides and bottom of the well pit to "maintain an equally distributed atmospheric pres- "sure upon the water, whereby the flow of water "into the well pit is made dependent upon the forces "of gravity, in the new process is removed from "within the well pit, and ceases there to operate "against the inward flow of water, so that the pres- "sure of the atmosphere operates with its full "power to force the water in the earth from the

"earth into the well pit, and without any opposi-
"tion caused by meeting in its flow the pressure of
"the atmosphere at the sides or bottom of the pit.

"This process involves a new idea, which was put
"to practical use when the method was devised of
"fitting tightly in the earth, by the act of driving
"without removing the earth upwards, a tube open
"at both ends but otherwise air tight, and extend-
"ing down to a water bearing stratum, to which is
"attached a pump; a vacuum in the well pit, and
"at the same time in the water bearing stratum of
"the earth, being necessarily created by the opera-
"tion of a pump attached to a pipe so driven.

"The novelty of the process under consideration
"does not lie in a mechanical device for sinking the
"shaft or raising the water to the surface, but in the
"method whereby water, by the use of artificial
"power, is made to move with increased rapidity
"from the earth into the shaft; whence it results,
"that a tube but a few inches in diameter, driven
"down tightly to a water bearing stratum of the
"earth, affords an abundant supply of water to a
"pump attached thereto, and constitutes a prac-
"tical and productive well.

"*Such an invention is without the field of me-*
"*chanical contrivance; it consists in the new ap-*
"*plication of a power of nature, by which new*
"*application a new and useful result is obtained.*

"There can be no patent for a principle; but, 'for
"'a principle so far embodied and connected with
"'corporeal substances as to be in a condition to
"'act and to produce effects in any trade, mystery,
"'or manual occupation, there may be a patent.'
"The idea or principle of forcing water from the
"earth into a well pit by the use of artificial power
"is new, but is not by itself patentable. The
"idea, when made available by a method whereby
"it is put to practical use, is patentable as a pro-
"cess and is thus secured to the person who has
"conceived the idea and invented the method.

"That method, in the present instance, consists in "accomplishing the result first conceived by the "inventor to be possible, by creating a vacuum in "the water bearing stratum of the earth and at the "same time in the well pit, by means of a tube pro- "jected into a water bearing stratum of the earth, "and connected tightly with the earth, to which "tube a pump is attached at the upper end.

"This constitutes 'a combination or arrangement "'of process to work out a new and useful result.' "It is 'a process combining instrumentalities before "'known, but not employed together, to accom- "'plish a new and useful result.'

"The elements of the process may be old, but "when combined for the purpose of putting to "practical use the *new idea of forcing water in this "way from the earth into a well pit*, they constitute "a new and useful process, within the meaning of "the patent laws."

"It thus appearing that the invention claimed by Green is found described in his specification, inasmuch as no violence will be done to the language of the claim by construing it to cover the invention, it is the clear duty of the Court so to construe it."

"If, by an examination of the specification and *applying it to the then existing state of the art*, we can learn what the invention was, then the claim, which was designed to be a condensed summary of the invention, is to be construed so as to be co-extensive with the invention, if that can be done without doing violence to its language." [Whipple *v.* Middlesex Co., 4 Fish. Pat. Cas., 42. See also Waterbury Brass Co. *v.* N. Y. Brass Co., 3 Fish Pat. Cas., 47. Leroy *v.* Tatham, 14 How., 181. Hawarth *v.* Hardcastle, 1 Webster's Patent Cases, 480. Turrill *v.* Railroad Co., 1 Wall., 491.]"

"So construed, this patent becomes co-extensive with the discovery, and secures an exclusive right to use the new idea or principle put to practical use by the new process described, for to use the language of the defendant's counsel (brief, page 27):

"If Green invented a process, it was not in fact dependent on the particular form of the instrument, nor does his specification so claim it."

"*The right secured by the patent is* not, then, the right to certain instruments, nor to a combination of instruments, but it is *the right to use his discovery in any method* presenting the characteristic features of his method, and *accomplishing the same result in substantially the same way.*"

"I therefore understand this patent to be a patent "for a process, and that the element of novelty in "this process consists in the driving of a tube tightly into the earth, without removing the earth upwards, to serve as a well pit, and attaching thereto a pump, which process puts to practical use the "new principle of forcing the water in the water "bearing strata of the earth from the earth into a "well-pit, by the use of artificial power applied to "create a vacuum in the manner described.

"In the present case, then, the well may be taken "to be a manufacture, and the claim of 'a process of "constructing wells,' like the claim for 'a manner "of constructing wheels,' will cover all wells constructed according to the process described, without regard to form, and whether the parts taken "separately be new or old. [See Many *v.* Jagger, 1 "Blatch., 273. See also Goodyear *v.* Railroad, 3 "Wall., p. 356.]

"I consider the original patent to have been for a "process, as is the reissue, and that the process I "find described in the reissue is also to be found "described in the original patent.'

Judges Nelson and Dillon said:

"The two patents (the original and reissue) on examination show that they were both granted for "'a process of constructing wells,' and the claim "and specifications describe the process, which consists in driving a tube tightly into the earth until "it reaches a water bearing stratum without removing the earth upwards, and attaching to this "well pit a pump, air tight, the tube being perfor-

"ated at the lower extremity and for a short dis-
"tance upwards to admit the water more freely to
"the inside. The reissue is not different from the
"original, and the claim does not include anything
"more than the patentee was entitled to.

"*It is a simple and cheap method of obtaining a*
"*supply of water, unknown untill Green's dis-*
"*covery, and the patent issued is for a process and*
"*not a result.* Although making a hole in the ground
"by driving a rod may be a part of the operation
"Green performs in obtaining a supply of water,
"his patent describes something more. Before his
"process this pit or hole could only be utilized as a
"well when by natural forces water flowed into the
"bottom, and a water bearing stratum must neces-
"sarily be reached, where these natural forces will
"cause a flow of water in such quantity that the pit
"becomes a reservoir, or produces a stream through
"the tube, as an Artesian well.

"Green, by driving a tube open at the lower end,
"as described, into the earth to a water bearing
"stratum, with the earth packed tight about it un-
"til the water is reached, and attaching to it a
"pump, air tight, constructs a well from which a
"supply of water is obtained when the pump is
"worked, and does not rely upon the ordinary
"operation of natural forces upon the water lying
"in the earth.

"The evidence shows that not only an abundant
"supply of water is thus obtained, but it is inex-
"haustible."

Judge Blatchford says, Andrews *v.* Cross: "The
"specification states that the instrument is to be
"driven down to water, and the earth it meets with
"is to be displaced by it and thus packed around
"it, and not removed upward from it; that the
"tube, which is either to be inserted in the place
"where the instrument has been driven down, after
"such instrument has been withdrawn, or is to be
"itself driven down in the first place, is to be air
"tight throughout its length, except at its bottom,

"where it has perforations to admit water; that "these perforations are made for the purpose "of obtaining a continuous flow of water; and "that, where the water does not flow out from the "top of the tube without the aid of a pump, a "pump is to be attached to the top of the tube by "an air tight connection. *The specification con-* "*templates the procuring of water. The process* "*seems to be divided into two stages—first, making* "*a hole for the tube down to water, by displacing* "*the earth by driving down a straight instrument* "*into the earth, so that the earth is packed around* "*the instrument; second, having in the hole thus* "*made an air tight tube, substantially as large as* "*the hole, with a pump attached to the top of the* "*tube by an air tight connection. The specifica-* "*tion does not otherwise explain the rationale of* "*the process which results in having the water* "*issue from the top of the tube.* When a rod "which is not a tube is driven down to water, "there is as yet no well. When the rod is with- "drawn, if the source of the water is higher than "the top of the hole, water will issue from the top, "and there is a well; and, when the air tight tube "is inserted in the hole, there is still a well. If the "rod is withdrawn and the air tight tube is insert- "ed, or, if such tube is driven in the first place, and "no water issues without the aid of a pump, there "is no well, in the sense of the specification, "till the pump is put on by an air tight connec- "tion, in such a way that, by the use of the pump, "the whole process can result in causing water to "issue from the farther upper end of what is so con- "nected with the top of the tube. *The construc-* "*tion of a well, spoken of in the specification* "*as the invention made, and which it must be* "*presumed was intended to be secured, is thus,* "NOT MERELY *the displacement of the earth by* "*driving down the instrument or the tube, but is,* "*in addition, having the air tight tube in the* "*earth with the earth packed around it, and a*

"*process arranged, by the mechanical aid of a* "*pump, attached by an air tight connection to the* "*tube, for causing the water to enter the perfora-* "*tions at the lower end of the tube and issue from* "*the upper end of the tube.* What particular "forces are in operation to produce this process of "obtaining water, when the well is not a flowing "well, is of no importance. The specification need "not explain. The mechanical means are fully "explained which result in the obtaining of the "water, from the commencement of the driving. "The process of obtaining the water comprehends "all the steps which form part of that process, as "they result from or attend the mechanical means "set forth. The process consists in having an air "tight tube with the earth tightly packed around "it, resulting from compacting the earth by dis-"placing it by driving a rod or the tube, and "having a pump attached at the top of the tube "by an air tight connection, and by the operation of "the pump, obtaining a supply of water at the top. "In describing how the invention is made and used, "so as to enable others to make and use it, the "description inclu les driving the rod, putting in "the air tight tube, and having the pump, and ob-"taining a continuous supply of water. The in-"vention being thus defined in the specification, "the claim is to be construed as broadly as the in-"vention, unless necessarily restricted by the lan-"guage used in the claim. The claim is: 'The "process of constructing wells by driving or forcing "an instrument into the ground until it is pro-"jected into the water, without removing the earth "upward, as it is in boring, substantially as de-"scribed.' Where the well is a flowing well, the "water will flow as soon as the hole is made, and "to make the hole by driving and displacement, "and insert the tube, and have the water flow, de-"velops the process. Where the well is not a "flowing well, the pump in addition is necessary, "and the use of the pump, in the well so made, is

"a use of the process. Driving or forcing an in-
"strument into the ground until it is projected into
"the water, without removing the earth upward as
"it is in boring, is an essential element in the pro-
"cess, in either case; and, where the well is not a
"flowing well, the claim is a claim to the process
"substantially as described, being the process above
"explained in case of a non-flowing well, an in-
"herent constituent of which is the driving process,
"the process claimed, however, including the other
"modes of operation which attend the procuring,
"by a pump, of water from a tube in a well so con-
"structed. In this view, where the well is a non-
"flowing well, the use, to procure water, of a pump
"in a well thus constructed and having its features,
"is a use of the process, although the person using
"the well and the pump and the process, may not
"be the person who caused the rod to be driven, or
"the hole to be made, or the tube to be inserted, or
"the pump to be attached. This reissued patent
"was under consideration in *Andrews* v. *Carman*
"(*13 Blatchf. C. C. R., 307*). In the decision of
"Judge Benedict in that case, the reissued patent
"was held to be valid; *the state of the art of con-*
"*structing wells at the time Green made his in-*
"*vention was explained;* the peculiar features of
"Green's driven well were commented on; the
"claim was held to be a claim to a process, the ele-
"ment of novelty in it consisting in driving a tube
"tightly into the earth, without removing the earth
"upwards, to serve as a well pit, and attaching
"thereto a pump, so that the process puts to prac-
"tical use the new principle of forcing the water in
"the water bearing stratum of the earth from the
"earth into a well pit, by the use of artificial power
"applied to create a vacuum in the water bearing
"strata of the earth, and at the same time in the
"well pit; *and it was also held, that the claim*
"*might well be construed as claiming the well as a*
"*manufacture constructed according to the process*
"*described.* The evidence in the present case shows

"that any person, by using a pump applied as "directed, on the tube as directed, in the well con- "structed as directed, will put to practical use "what is in *Andrews* v. *Carman* defined to be the "'new principle.' Although the specification does "not state what such new principle is, the evidence "in the present case shows what it is, and that it "is certainly and effectively developed, to the end "of obtaining a copious, continuous and unfailing "supply of good water, and that it is what is thus "set forth in *Andrews* v. *Carman*. It may be that "the inventor did not know what the scientific prin- "ciple was, or that, knowing it, he omitted, from "accident or design, to set it forth. That does not "vitiate the patent. He sets forth the process or "mode of operation which ends in the result, and "the means for working out the process or mode of "operation. The principle referred to is only "the why and the wherefore. That is not "required to be set forth. Under § 26 of the "Act of July 8th, 1870 (*16 U. S. Stat. at Large, "201*), under which this reissue was granted, "the specification contains a description of the "invention and of 'the manner and process "of making, constructing, compounding and using "it,' in such terms as to enable any person skilled "in the art to which it appertains, to make, con- "struct, compound and use it; and, even regarding "the case as one of a machine, the specification ex- "plains the principle of the machine, within the "meaning of that section, although the scientific or "physical principle on which the process acts, when "the pump is used with the air tight tube, is not ex- "plained. An inventor may be ignorant of the scien- "tific principle, or he may think he knows it, and "yet be uncertain, or he may be confident as to what "it is and others may think differently. All this is "immaterial, if, by the specification, the thing to be "done is so set forth that it can be reproduced.

"This reissue was also adjudicated upon by Judges "Dillon and Nelson, in *Andrews* v. *Wright* (13 *Off.*

"*Gaz. of Pat. Off.*, 969), and the claim was construed "to be for a process such as I have defined it to be.

"Under this construction, the defendant has in- "fringed by using a pump in a driven well con- "structed in a house hired by him, to obtain a sup- "ply of water for the use of his family, although he "may not have paid for driving the well or have "procured it to be driven. Such use of the well was "a use of the patented process.

"The invention of Green is shown to have pre- "ceded any invention made by Suggett and described "in his patent of March 29th, 1864. The evidence "also shows that none of the defenses set up in the "answer are established. The conclusions arrived "at in the decision in *Andrews* v. *Carman* are sup- "ported by the testimony in this case."

Judge McCrary says, *Andrews* v. *Long:*

"The evidence in this case clearly shows that the well constructed and operated by the respondents was made by *boring* a hole in the ground with an auger, somewhat *larger* than necessary, for the insertion of the pipe or tube, and by *putting* the tube down said hole to the water *without* driving or forcing."

"One of the necessary features of the invention, and perhaps the *principal* one, is the 'feature of a *tight connection*' between the tube and the earth, effected by the driving of the tube without removing the earth upward, upon the preservation of which (the 'tight connection') the success of the process depends—*Andrews* v. *Carman*."

"If the boring be resorted to merely for the purpose of *facilitating* the driving process—that is to say, if the hole bored be smaller than the tube to be driven in, so that the tube is, after all, driven or forced into the earth—so as to form a *tight connection* between the tube and the earth, the well thus constructed would, in my opinion, be within the terms of the patent; but if a well is sunk by digging or boring, so that the *excavation* is larger than

the tube to be inserted, and *nothing is done but to put a tube down into the excavation without driving*, and attach a pump, and in this way secure water, I am clearly of the opinion that such a process is not within the terms of the patent.

"I concur in the construction given to this patent by Judge Blatchford."

III.

Infringement.

Appellant devotes the larger part of his brief to enforcing the defense of non-infringement. This he does by the extravagant claim, in substance, that there cannot be an infringement unless the well is *wholly* made by *driving*; that if the upper crust of the earth be so hard as to need a drill, and the drill be used for a *part* of the way, and the *driving* be used for the other and lower parts, there is no infringement.

It is equal to saying that if I wish a well in my flagged sidewalk, and a stonecutter should drill or chip out a *hole through the flag*, and the tube be put through this hole, and then be *driven* the rest of the way (as described in the patent), that such a well would be outside of the patent! Or that if I had an old dug well three feet across, which had gone dry, that it would not be an infringement, if I had a well *driven* (as described in the patent) in the *bottom* of that old dug well!!

Appellant's brief claims to print *all the testimony* as to infringement; in point of fact it omits the deposition of the appellant himself.

Clark says (Rec. 35):

"5 Q. Please describe fully and particularly the process used by you in constructing the defendant's wells.

A. First we bored with a *three-inch* auger down to water; then we coupled the pipe together with the well tube with the point on it, and then either *drove* it or *pressed* it down—I could not say which, I don't recollect—from *three* to *five* feet; probably about *four* feet, I could not recollect; we put on a Douglass pump; I could not say whether it was No. 1 or No. 2; we generally used No. 2 to it.

6 Q. Please describe the construction of the bottom part of the tube you used.

A. It was *one and a quarter inch pipe*, with quite a number of holes drilled from an inch from the threads, up two feet; the strainer was two feet long; then we lined it with fine wire cloth inside, and perforated brass inside of that.

7 Q. After *driving* or *pressing* the pipe, did you *remove any earth upward?*

A. *No, sir.*"

Judge Shipman says: "The defendant's two "wells were made by Frederick B. Platt and "Daniel Clark.

"Platt's testimony is as follows:

"6 Q. State fully and particularly the process "used by you in constructing these wells?

"A. We had a hollow auger that bored a hole "about *three inches* in *diameter*, with which we "bored the hole till we struck water; then we "coupled the pipe together, and either *drove* or "*pressed* the pipe into the water below the "strainer.

"7 Q. What do you mean by *driving* or *press-*"*ing* the pipe into the water below the strainer?

"A. I mean by *driving* the pipe *striking it* on "top *with a maul*, and by pressing it, we put a "chain on the pipe above, and used a lever with a "purchase to push it down; this was done *after* "the hole was bored.

"10 Q. How far did you ordinarily *drive* or "*press* the pipe?

"A. From *three* to *five* feet.

"11 Q. Into what did you drive or press the "pipe?

"A. *Into the wet sand.*

"20 Q. Describe fully and particularly the pro- "cess used by you in constructing these (the de- "fendant's) wells, specifying what difference there "was, if any, between them?

"A. I don't know as there was any difference "from what I have described; we bored a hole as I "said before, in the ground to the water, inserted "the pipe, and either *drove* or *pressed* the pipe "into the water from three to five feet, and at- "tached a pump to the top, a *pump constructed for* "*a Driven Well, I believe.*

"21 Q. What do you mean by into the water?

"A. The water *in the ground.*

"22 Q. You did not strike a solid body of water, "did you?

"A. I struck water enough to supply the pump; "that was all we was after, generally.

"23 Q. Do you *mean* by *into the water*, into the "*water bearing stratum* of the earth?

"A. *I suppose so.*

"24 Q. What was your object in *driving* or "*pressing the pipe* in the manner which you have "testified?

"A. To get a *supply* of water for the pump.

"25 Q. State whether or not a supply of water "was furnished for the pump *before* the *pressing* "or *driving* took place?

"A. *It was not.*

"29 Q. State whether or not, *after driving* or "pressing the pipes, as you have testified to, you "*removed* any earth *upward* in constructing these "wells?

"A. *No, sir.*

"The testimony of Clark is more brief, but to the "same effect.

"The defendant's counsel strenuously urge that "these wells were constructed by boring, that the

"wells were bored until water was struck, *that is*, "*until a supply of water was obtained*, and that "the wells were finished by pressing the pipes more "deeply into the source of supply, which had been "reached when the workmen 'struck water.' In "other words the defendant seeks to bring the case "within the decision of Judge McCrary in Andrews "*v.* Long, 12 Fed. Rep., 871."

"In this case, however, the witnesses, when they "used the common expression 'struck water,' did "not mean that they had reached an adequate "source of supply for a well, but that they had "reached a place *where the presence of water* "*manifested itself*, and where by continuous ex- "cavation an adequate supply would be obtained. "The wet sand or wet clay upon the auger showed "that water was at hand. The well was then fin- "ished and a supply of water was obtained by "pressing or driving a tube into the ground, with- "out removing the earth upward, and attaching "thereto a pump. When this was done, there was "put 'to practical use the new principle of forcing "'the water in the water bearing strata of the "'earth, from the earth into a well pit, by the use "'of artificial power applied to create a vacuum in "'the water bearing strata of the earth, and at the "'same time in the well pit.'

Andrews *v.* Cross, 8 Fed. Rep., 269.

"A workman in our New England soil would not "ordinarily be able to drive or press a tube into the "stony or tough crust which must be penetrated "before water bearing strata are reached, but it is "no adequate argument against infringement that "it is necessary to bore or dig into the rough and "hard soil or the mass of tough clay, which lies "over the sources of water supply, *provided*, "*before a supply of water is reached, the patented* "*process is thereafter used for the purpose of ob-* "*taining an adequate flow of water upon the sur-* "*face of the ground*."

The defense of non-infringement must be held to be frivolous.

IV.

Prior Patents and Publications.

Of the 28 prior patents named in the answer all are abandoned except two:

1. The Suggett patent, of March 29, 1864.
2. The Goode English patent of 1823.

1. The Suggett Patent.

There is no testimony in this case as to the date of the Suggett invention, or the Green invention.

But in Andrews *v.* Carman it was judicially determined (and is not controverted here), that Green's invention was made in the Fall of 1861, and there is no proof as to date of Suggett's invention except the date of his patent, 1864.

But, there was an elaborately contested interference between one Mudge and Suggett and Green; this interference was argued on appeal before Judge Fisher, in the Supreme Court, D. C.

The whole decision appears in the Record at p. 75. Judge Fisher held as follows:

"After a full and elaborate argument by counsel "for all the parties in this case, and an examina- "tion of the testimony, I fail to discover any good "reason for reversing the decision of the Commis- "sioner of Patents, 'awarding priority of inven- "tion to James Suggett *in regard* to what is "*claimed* by him in *this patent*,' and ordering a "patent also to Nelson W. Green in accordance "with the amendment filed by him September 14, "1867.

"I am clearly of opinion that Green first put into "practice the conception of making a driven well, "and is entitled, therefore, to his patent for the "*broad* claim of sinking wells by driving down the "*pump* or rod, without removing the earth upward; "and that *Suggett was entitled to a patent for the* "*perforated pipe and point* for sinking wells, and "I therefore affirm the decision of the Commis- "sioner."

An inspection of the Suggett patent (Rec., pp. 70-72) shows that the patent was for an instrument to be used in making *bored* wells. The *claim* is: "The perforated pipe *a*, with the pointed end *b*, constructed as a *drill*, and united with a pump, all substantially as shown and described."

No argument is needful to show that this *claim*, which was awarded by Judge Fisher, is a claim for a mechanical combination, a *tool* or "drill," as expressed in the claim.

While Green's claim was and is for a *process;* in practicing Green's process he might or might not use Suggett's specific mechanism; and Suggett might or might not use Green's process when he used his own mechanism, for the Suggett device was as capable of use in a dug well as in any other.

For the purposes of this appeal, Judge Fisher's decision in the interference case awarding Green the broad claim over Suggett, eliminates the Suggett patent as a defense; there being no proofs here as to their dates of invention.

2. The Goode Patent.

We adopt the views of the expert Andrews concerning this patent (Rec., p. 39), as follows:

"Exhibit No. 4."

"Being a copy of an English patent, granted to "John Goode, enrolled October 16th, 1823, de- "scribes numerous tools, appliances and appurten- "ances for making artesian wells, by drilling, bor- "ing and raising the earth and material from the "opening thus made, which forms the body of the "well, to the surface; the patent being, as stated "in the specification, for certain improvements in "tools or apparatus for boring the earth for the "purpose of obtaining and raising water.

"I do not find described in that patent either the "process, construction or mode of operation set "forth in the patent in suit; there is no description "given of any method of piercing the earth by a "simple puncture and forming an opening for the "body of the well, without removing the earth up- "wards; there is no description of a process for "obtaining water from the wells, by a method "utilizing the discovery of Col. Green, that, when "a tube which is air tight from its upper end down "to and into a water stratum, has a pump attached "to its upper end by an air tight connection and "operated in the usual manner, shall, by removing "the atmospheric pressure from the body of the "well, cause the water in the earth, by the pres- "sure of the atmosphere thereon through the "superincumbent earth, to flow directly from the "earth into the well, at a velocity due to such "pressure; and because I find no such description "in such patent, I say there is nothing therein con- "tained describing a well which, in its process, "construction or mode of operation, anticipates or "is like the invention described in the patent in "suit."

Prior Publications.

"Defendant's answer sets up a formidable list of "fifty-three different printed publications, Rec. p. "82. Sixteen of these are in evidence; concerning "none of them, nor concerning any of the patents,

"have the defendants examined any expert; the "Court is left unaided to dig out of this vast "mass that which is or is not material. In the "Carman, French and Wright cases great stress "was attached to four printed publications; that "in Ure's Dictionary; that in McKenzie's 'Five "Thousand Receipts;' that in the Report relating "to the Syracuse salt wells, and in Rees' Encyclo- "pædia, and these defenses were all overruled in "those cases, and should not further occupy the "time of this Court.

"We adopt the views of the expert Andrews "in regard to the printed publications 5-20 as fol- "lows:

Exhibit No. 5.

"An extract from the Repertory of Patented In- "ventions published in London in 1827, is in the "main a repetition of the specification of the patent "of John Goode, as described in the patent in "Exhibit No. 4, but appended thereto is the state- "ment that,

"'The patentee mentions that tubes with valves "at their ends and containing pistons like figure 5, "moved by a cord, may be used for drawing it "(the water) up, but it is evident that the use of "these could be only temporary, as without pipes "of some kind the whole will soon fill up, and "when pipes were used, it is obvious that they "might be made to act as a pump, by being fur- "nished with pistons and valves.'

"Nothing contained in this exhibit changes the "opinion I have given in regard to the Goode patent, "or shows it to be in any respect like the descrip- "tion given in the patent in suit.

Exhibit No. 6.

"Is an extract from the Dictionary of Arts, "Manufacturers and Mines, by Andrew Ure, pub- "lished in New York City in 1847, by D. Appleton "& Co., at page 63, under the heading 'Artesian "Wells.'

"This is mainly in reference to the patent of "John Goode, as set forth in Exhibits Nos. 4 and 5, "coupled with the remark, that 'In the process of "boring, there does not appear to be anything new "proposed, but that these several tools are to be "employed for boring, packing and otherwise pene- "trating and raising the earth and extracting "broken or injured tools.'

"'There are also suggestions for employing long "buckets,' also lift pumps, with a succession of "buckets, but as these suggestions possess little if "any novelty, it cannot be intended to claim them "as part of the patent.

"Nothing contained in this extract in any way "changes the opinion I have given, with the reasons "therefor, that the invention set forth in the patent "in suit is not described or anticipated by anything "contained herein."

Deft.'s Exhibit No. 7.

"Is an extract from page 388 from McKenzie's "5,000 Receipts Article 'To raise water in all situa- "tions.'

"There is not in that extract any description by "the following of which a man could make any "kind of a well, and nothing contained in it "describes, refers to, or even suggests such a well "as is set forth in the specification in the patent in "suit. And as further reason for saying that it "does not describe such a well are the facts that the "same extract was set up in the cause of Andrews "*v.* Carman, and also in the cause of Hine & Ste-

" phenson *v.* Wahl, and by the decisions in those " causes judicially declared not to contain an antici- " patory description of Green's invention."

Deft.'s Exhibit No. 8.

" Is an Extract from Rees' Encyclopædia, Vol. " 40, Philadelphia, 1819, published by Samuel D. " Bradford, under the heading,

' Well in Rural Economy,'

" The statement therein contained is: 'That a " French philosopher *proposed* that the ground " should be perforated by means of an auger or " borer, a cylindrical wooden pipe being then placed " in the hole and driven down by a mallet, and the " *boring* continued, that the pipe may be forced " down to a greater depth.' * * * *

" ' In proportion as the borer becomes filled with " earth it should be drawn up and cleared.' * *

" ' The boring may be carried to much extent " under ground.'

" This statement was in evidence in the cause of " Hine & Stephenson *v.* Wahl, and was decided not " to anticipate Green's invention, nor is there any- " thing in the article describing any portion of the " invention as set forth in the patent in suit."

Deft.'s Exhibit No. 9.

" Extract from the Journal of the Franklin Insti- " tute, Third Series, published in 1844, from Vol. " 12, page 128.

" This extract contains no description of any well " of any kind ; it merely states that in sinking a well " at the Portsmouth dockyard, one of the principal " docks gave way in consequence and the sinking " of the well was abandoned."

Deft.'s Exhibit No. 10.

" Is an extract from 'Brand's Encyclopædia or " Dictionary of Science, Literature and Art,' Harper " Bros., New York, 1843, vol. 3, page 1333, under " the heading 'Artesian Well.'

" No *description* of *any* well appears in this ex- " tract. The reference is as follows: 'All that is " necessary, therefore, is to bore down to the stratum " containing the water, and, having completed the " bore to insert a pipe, which may be either left to " overflow into a cistern or it may terminate in a " pump.'

" I found, on consulting the dictionary, between " the words 'pipe' and 'which,' the words 'into the " bore.' I also found in addition to the extract, and " following it, a statement that when the water " would not rise to the surface a well may be sunk " to a certain depth, the auger hole made and the " pipe inserted into it at the bottom of the well (and " from the bottom of the well), it may be pumped " to the surface by any of the usual modes, and " continues with the statement that at Chelsea, in " 1793, a well was dug 394 feet within 20 or 30 feet " of the river Thames; that usually they bored 10, " 15 or 20 feet below the bottom of the well, and at " the last boring that the water rose rapidly 200 feet, " scarcely allowing the digger time to withdraw the " borer and tools and be drawn up; the article, " further continuing, speaks of the process of bor- " ing used by Mr. Goode, who put down successful " wells at Tottenham and Mitcham, both of which " at one time equaled 8 gallons per minute, but had " been much reduced on account of the great " number of holes.

" These latter statements go to show that the " Artesian well making, at the date of that publica- " tion, 1843, still followed the method of boring as " long previously practiced, and states 'that the " process of boring the earth for spring water has " lately been practiced with great success by Mr. " Goode.'

" For these reasons it is evident to my mind that " nothing at that date had been known or published " describing the method invented and patented by " Col. Green.

Deft.'s Exhibit No. 11.

" Is an extract from Rees' Cyclopædia purporting " to be from Vol. 35, under the heading

" SPRING DRAINING PUMP."

" Speaks of a pump constructed of copper ' in the " pipe form, in a very neat, simple, cheap and " simple manner, so as to admit of being put down " into the ground in holes formed by the boring " auger; and being made to be wrought as a pump, " is capable of showing the presence of water where " the pressure of it in the higher grounds above is " not sufficient to force it up through the auger " holes, which is the case in many instances.

" This description does not give or set forth any " of the characteristics of a driven well, either in " its method of making, mode of operation, or " results; it is a mere placing of a pump in an " auger hole, to ascertain the presence of water; it " does not describe a pipe tightly inserted into the " earth, and receiving water directly from the " earth by the pressure of the atmosphere, forcing " it into the well, which had been previously re- " lieved from the pressure of the atmosphere, nor " was it used as a well. The entire description " leads me to believe that the pump with its copper " tube was inserted into a well hole of considerably " larger diameter, leaving the pressure of the atmos- " phere to act directly upon the surface of the water " in the well, surrounding the pump pipe, but the " description is not such as would enable any per- " son to do the same thing in the same manner " without further instructions. This extract was

"set up by defendants in the cause of Andrews "*et al. v.* Carman, and Hine & Stephenson *v.* Wahl, "and in those cases decided not to have been an "anticipation of the invention of Green, as set "forth in the patent in suit.

Deft.'s Exhibit No. 12.

"Extract from the London Encyclopædia, London, "1829, Vol. 22, page 593, headed

"WELL TUBE.'

"An *hydraulic instrument* for procuring water "in almost any situation, *suggested* by M. Cadet de "Vaux.

"He directs the tube to be placed in the hole "and driven down with a mallet; after which the "boring must be continued that a pipe may be "driven to a greater depth. As the auger be- "comes filled with earth it ought to be drawn up "and emptied. * * * * *

"The boring is carried to a considerable extent "under ground, and water is in most instances ob- "tained * * *

"The plan of *boring for water* has of late been "much practiced in the neighborhood of London."

"This is not such a description of a method of "making and operating a well as would enable any "person, by simply following the instructions con- "tained in the article, to make a well, but with the "knowledge I have obtained from the extracts here "offered as exhibits, and other matter from the "same works, and from other publications relating "to well making, it is plain to me how the author "*intended* parties to proceed, and that the method "he proposes is in its main and important features, "and intended to be the same, as the plan that had "then of late been much practiced in the neighbor- "hood of London, to wit.

"Sinking a well by driving down a tube, boring "or drilling out the earth and rock, and bringing it "to the surface, with such or similar tools as are "described in Goode's patent."

Deft.'s Exhibit No. 13.

"An extract from the Mechanics' Magazine, "London, 1824, Vol. 2, pages 15 and 16, under the "heading

'BORING WELLS.'

"This extract is a copy of a letter from a well "sinker, stating his difficulties, and asking for in- "formation as to how he can overcome them; also "an extract from the same work, Vol. 2, page 60, "being an answer to a well sinker's inquiry as to "how he should overcome his difficulty, and "signed "T. T.," and advises the driving down of a "cast iron pipe, the use of boring rods, and the "*shell borer* to bring out gravel that gets into the "pipe.

"Nothing contained in this exhibit has any rela- "tion to such a well as described by Col. Green in "the patent in suit, and, in fact, is nothing more "than a suggestion, to a party in the business, how "to proceed under certain emergencies, and is not "such a description as would enable any person by "following it alone to make a successful well, much "less a well constructed as, or operating in the "manner of the well described in Letters Patent in "suit."

Deft.'s Exhibit No. 14.

"Extract from Harpers' New Monthly Magazine, "September, 1851, page 640, Harper Bros., New "York.

"Nothing is herein contained except by inference, "as to a well of any kind. It says:

"After going as deep as the gravel or quicksand "in which the first vein of water is found will per- "mit, and reaming out the hole, the log is inserted, "having its lower end sharpened and defended by "a tapering iron band well secured. This may be "driven down without much trouble through the "bed of quicksand, and a passage is thus secured "to the rock."

"This description of the log, so far as it goes, gives "the general method in use for sharpening logs, as at "that time used for making Artesian wells; that is, "by surrounding the bottom end with an iron band "tapering to an edge at the bottom. It is at best "but a very imperfect description, even of that, and "can only be understood when read in connection "with other exhibits in this cause, and other "articles upon the subject of Artesian well boring."

Deft.'s Exhibit No. 15.

"Is an extract in the French language from 'De "l'Art du Fontenier Sondeur et des Puits Ar- "tesians,' Paris, 1822, page 99, secs. 79 and 80, "page 106, sec. 88, also pages 107 and 108, sec. 91, "pages 109 to 112, and page 113, sec. 95, with "translations into English furnished by defendant.

"These extracts also relate to the making of the "long well known open Artesian well. They do "not contain such a description of well making, as "if followed exactly would enable a party to make "a successful well of any kind, but in connection "with the information upon the subject, contained "in this and other extracts filed as exhibits in this "cause, and from information derived from other "works upon the subject, I am enabled to form a "pretty accurate opinion as to what style of wells "and their method of making is referred to. The "boxes referred to are undoubtedly square wooden "boxes with their lower ends sharpened and pro- "tected by an iron band brought to an edge at its

"lower extremity, which boxes are driven down "through the loose earth and quicksand, which "are taken out, from and through them (the boxes) "as they are sunk into the earth, their use being to "keep the sand and loose earth from falling into "the opening into which the buses are to be in- "serted. These buses or pipes of wood being "guarded at their lower ends by iron bands made "sharp upon their lower edge, *like* the bands upon "the lower ends of the wooden boxes, as is dis- "tinctly stated in the translation, although *this iron* "*guard* upon the end of the pipe, which in the "original French is *termed a sabot*, is *in the trans-* "*lation* rendered a *point*, the literal definition "being a shoe, but whether a shoe or a point, the "statement from page 109 is, that the tubes are put "into the calcareous strata which previously is "bored a diameter of 7 inches, in order that they "can enter therein, only by means of hard forcing. "The wooden tubes having been previously de "scribed in section 80 as being of seven inches ex- "terior diameter; their exterior diameter being "seven inches, and the diameter of the bore, as on "page 109, also being 7 inches, making a tight fit, "the object evidently being to prevent the upper "stratum of water passing down between the "wooden tube and the calcareous stone or earth "surrounding it, thus preventing any water pass- "ing up through the tube, except the water in "the stratum below the calcareous; that the "wooden tubes are protected by an iron ring or "shoe instead of having a point is evident from the "fact that with a point there would be no means of "ingress for the water into the tube, as no provi- "sion is made, suggested or hinted at for the "entrance of water into the tubes except through "their open lower end. If, however, such provi- "sion were made for entrance of water through the "points into the tubes, still as it is distinctly stated "that the hole is drilled previously to the tubes "being put in, whether they are protected by a

"shoe or point they are not driven to form a well "without the removal of earth upwards, so that it "is totally immaterial whether the drilling takes "place through the open ended tube or is first "done before the tube is inserted. Therefore, from "this description, it is evident that *in their methods "of construction*, the wells referred to in Exhibit "15, are not made in the manner set forth in the "specification of the patent in suit. The article "from section 94 which closes with the statement "that if the waters do not rise inside of them to "be poured out on the surface of the ground, "but remain stationary a few meters below, "then 'there is used in order to draw them up, "pumps like those which are constructed in "every country. Nothing in this statement "regarding the use of pumps shows, suggests or "hints at the employment of Green's method "of obtaining water from the earth *or in any "manner utilizing his discovery;* nothing is de-"scribed other than the old well known and often-"described methods of procuring water from the "earth by the Artesian process, the water either "flowing over the top of the well or in default of "its rising high enough to flow, it is pumped from "the well by a pump having its suction pipe in-"serted down into the well, and not connected "thereto by an air tight connection. I have omitted "to notice that portion of the article, page 113, sec. "95, which is merely a statement, that sometimes, "after a number of years, the volume of water from "wells established according to the principles and "processes described, diminishes, and gives a "method of operation by which, by the stroke of a "piston, the calcareous parts which stop the fis-"sures through which the water bursts, are forced "to ascend to the surface of the ground, but noth-"ing therein contained refers to anything described "in Letters Patent in suit."

Deft.'s Exhibit, No. 16.

"Extract from 'Bulletin de Musée de l'Indus-
"trie, 1846, Vol. 10, page 163.' Translation.

"Contains no description of a well of any kind, or "the method by which water is obtained from the "earth by one. It speaks, however, of boring a "well, and to depth of 1,000 meters (some 3,250 "feet); this last statement of fact being of itself "alone sufficient to show that the well was of an "entirely different character from the well de-"scribed in the Letters Patent in suit; and further "it says, I have brought up by this means pebbles "of six centimeters in length and three centimeters "in thickness, a state of facts which could not exist "in the operation of a well made in accordance with "the specification of the Letters Patent in suit."

Deft.'s Exhibit, No. 17.

"Being an extract from 'Hericart du Thury Jail-
"lissement des Eaux,' Paris, 1829, pages 274 and "275.

"Gives a very indistinct, and not by any means a "full description, of making an Artesian well by "boring and putting down a pile with a bore hole "through its entire length, of three inches in diam-"eter, furnished with iron at both ends, the one "which is to enter the ground should be as sharp as "possible; they drive this pile with the beetle as far "as possible, and *when there is no means of making "it enter any further they employ the auger, which "should finish the boring of the well.*

"This description, such as it is, occurs in a dis-"course by the author, which is at the end of 'My "Course of Mathematics.' It is not such a descrip-"tion as, by which, without further information, any "man could make a well, and contains nothing which "can be construed into a construction of a driven "well, made according to the specification of the

"Letters Patent in suit, but, so far as it goes, is in "perfect accord with other numerous descriptions of "the making of Artesian wells by boring, drilling, "etc., and raising the earth displaced by the tubes "to the surface."

Deft.'s Exhibit, No. 18.

"An extract from F. Arago Oeuvres, tome 6, "page 457, Paris and Leipsic, 1856. Translation "furnished by defendant, appears to be an addenda "to an article in which some system has been de- "scribed, and speaks of an injection of the water "that takes place through the inside of the boring "apparatus, and says :

"'The idea of causing the water to come up "through the inside of the pipe of the well, offers an "easy means of *boring* below a sheet of rushing "water *without having need of a pump.*' * * * '*It* "*will drag to it and bring up to the surface of the* "*ground all the detritus.*'

"Nothing herein contained has reference to the "methods of making Driven Wells; but, so far as "it goes it described a method directly and entirely "antagonistic to the method of procuring water as "by the specification of the Letters Patent in suit."

Deft.'s Exhibit, No. 19.

"Extract from a work of F. Garnier, 'Traite sur- "les Puits Artesiens,' Paris, 1826, pages 207, 208, "210-227 and 228. Translation furnished by de- "fendant.

"Contains a repetition of the method of opening "seams to admit of the passage of water into the "well, the fissure having been narrowed by calcare- "ous parts, which are interpolated there; practi- "cally the same operation as described in Exhibit "No. 15, which is by the same author.

"In the plates which accompany this article in "the original French, the logs which line the well "are shown with open ends, and are undoubtedly "of the same character as the pipes or buses which "are described in the article Exhibit No. 15. It "goes on to state: 'We have performed these "operations on a well made since the year 1810, in "a piece of ground of which figure 4, plate 2, pre-"sents the vertical section, and we have found * "* * that the volume of water produced was "* * * twenty-one cubic meters per hour, whilst "it was before this operation only fifteen cubic "meters.'

"The purport of this entire article, as well as the "article Exhibit No. 15, by the same author, goes "to show that the water obtained by these wells "was procured not from the earth, but from fissures "in the rock, and that the water flowed from the "wells.

"Figure 4, plate 2, referred to in the quotation "above, in the original work shows a tube open at "both ends and no pump of any kind operated with "it. That portion of the extract from pages 227 "and 228, speaks of 'cast iron pipes, about which "we have just been occupied,' evidently referring "to a description preceding the extract; and says "that by the means of a single pipe to restrain the "sands which are met, one succeeds almost always, "even when the thickness of the sands exceed 100 "feet.

"'When these sands are perfectly supported, they "proceed then with the boring into the midst of the "clays, giving to it until they have reached the "chalky limestone, a diameter of four inches, "* * * that the beds of sand are passed more "quickly by using cylinders of cast iron than with "boxes of wood and that because the ground need "not be bored to so great diameter.' * * *

"'One should nevertheless employ the English "process only when it is a question of placing wells "in grounds which present, in order to be passed

"through, great difficulties, and which require the "use of three or four boxes, because the expense, "then, is very nearly the same in both cases.'

"These boxes are driven down, one inside an- "other, each succeeding being smaller than the one "preceding, and not being one continuous box or "square tube; and their use is positive proof that "the process of well making, as described in the "article, had no likeness or analogy to the process "described in the Letters Patent in suit; and the "method of procuring water does not utilize the "discovery of Col. Green, and nothing is described, "suggested or even hinted at, which involves *his* "*method of construction or operation, or utilizes* "*his discovery.* Every portion of the description "relates to an entirely different mode and method."

Deft.'s Exhibit, No. 20.

"Extract from the Encyclopædia of Domestic "Economy, Harper Bros., New York, 1849.

"This extract is a description of an ordinary suc- "tion pump and its working. The figure connected "with the article in the work itself, is a cut showing "a suction pump with its suction pipe inserted into "an open well. No description is given of the well "or its manner of making, but the cut speaks for "itself. There is nothing relating to a driven well, "an Artesian or any other well; it is simply and "only a description of such a suction pump as has "been in use as long as I can remember, and noth- "ing in the article, or in the cut annexed, has any "relation to, or connection with, a driven well, "and, in fact, except as shown in the cut, there is "no reference to a well of any kind, if indeed the "cut represents anything more than a tank of "water into which (the water), as the article states, "the suction pipe is plunged.

"In addition to this direct testimony regarding the twenty Exhibits introduced by defendants (and

the only testimony in the case concerning them), we refer to the testimony of the same witness (Q. and A. 9 and 10, Rec. 49–55) giving extracts from English scientific and government publications, and papers read before the leading societies of English and London engineers, which give the strongest corroborative testimony in support of his views regarding the various exhibits set up by appellants, but especially to those in connection with the Goode patent, which had at the time of the cited publications, been in well known public use in the vicinity of London for over 40 years; and still these engineers, scientists and army officers, men whose calling insure their knowledge of these matters, unanimously credit the Driven Well as an 'AMERICAN INVENTION' and the British Government itself adopted their use (paying royalty therefor), in the Abyssinian expedition, sending out a special corps of well sinkers under Lieut. Le Mersurier, assistant field engineer, to set up 'THE NEW AMERICAN DRIVEN WELLS AND PUMPS' at different points on the army's line of march" (Rec. 51-52).

The *driving* of a well, to utilize Green's discovery, is only necessary to be such as shall insure the openings in the tube to be in close contact with the earth below the surface of the water in the earth so that there shall be no free water between the well tube and the earth in the water stratum. Driving from the surface of the ground to water may not in all cases be the easiest or most expeditious, but when water is reached, the tube must, to a distance above the openings for the admission of water, be in close contact with the earth, which condition is insured by driving or forcing down the tube after the water in the earth is reached, and the pressure of the atmosphere is utilized to force the water directly from the earth into the well, which it will not do, if free water surrounds the tube from its surface down to the openings, and the earth is not there in contact with the tube.

V.

Laches in Bringing Suit.

This defense is not set up in the answer.

Appellant speaks of the "ill repute" of the Green patent. The expression is ill founded; there is not a word of proof to sustain it.

The patent has been in constant and extended litigation from Brooklyn to Des Moines ever since the grant of reissue in May, 1871. Evidence shows from 500,000 to 1,000,000 of the wells in use, the greater part infringements. The case of Andrews *v.* Carman was begun immediately after grant of reissue. Equity will not expect a patentee to bring suit promptly against *every* infringer, or be charged with *laches*—this would be requiring an impossibility.

Judges Nelson and Betts held that the owner of a patent was not to be charged with *laches* because he withheld suit during the pendency of other suits to determine his rights under the patent.

Van Hook *v.* Pendleton, 1 Blatch., 193.

So held also, in a suit under the Green patent, by Judge Nixon.

Green *v.* French, 16 O. G., 215.

A patentee is not required to notify an infringer of his infringement; the *patent* itself, as the very word implies, is sufficient notice.

It has been a matter of notorious publicity that the owners of the Green patent have been for 15 years vigorously enforcing their rights all over the country, by, perhaps, the most extended patent litigation ever known.

The bill avers notice to defendant, and his disregard of such notice; the answer fails to deny such averment.

Eames, the appellant, testifies that the wells in question were put down by Clark and Platt in the Fall nine years ago; as he so testified in November,

1880, the wells were made in the Fall of 1871. He also says: "Q. 6. State whether the wells, or either of them, have been in operation from the time when they were constructed until now, and *in use?*

"A. *Most of the time.*" (Rec., p. 34.)

Under the construction given by the Courts above cited, each *using* of the well was an infringement, so that it follows that the infringement charged covered not alone the *making* in Fall of 1871, but each and every act of *using* up to the filing of the bill.

This defense, therefore, is not tenable.

VI.

The Reissue Question.

The patent, as a "*Reissue*," is assailed on several grounds:

1. For repugnancy to the original.
2. For omitting the "Suggett disclaimer."
3. For *laches* in making application.

The omission of the Suggett disclaimer has been sufficiently considered—*ante* p. 30.

The other grounds will be considered together, at some length.

Col. Green, an army officer, when about to lead his regiment to the field early in the war, desired to add to the efficiency of his command by devising a new and better mode of procuring water for troops on the march, and inspired by that wish, *discovered* that if a tube open at or near its lower end was projected down into a water bearing stratum, with a pump at its upper end, the water could be drawn from that tube and thence delivered continuously in large quantities.

While this discovery remained untested it was only an interesting theory. When tested and demonstrated by experiment, the discovery became clothed with the qualities of an invention, and entered the domain of patent law. The abstract became concrete—the "principle" became so identified with the mechanical process that the process became patentable and the patent drew to itself all the value of the doctrine of equivalents.

In other words the thing invented was not a tool, or a *mere* mechanical operation, but a broad *process*, first utilizing a great discovery or principle.

Having first noted the principle, having first put it in use, and having first discovered *one* practical operation or process, the inventor became entitled to protection commensurate with this truly great invention, and, of course, such protection must include all means which utilize the discovery in substantially the same way.

The invention was a new process of constructing wells, or a new process of obtaining a supply of water.

It was not the invention of a *machine*, or a *tool*, or any combination of mechanism.

And the inventor always expressly claimed the process, and indeed the intendment of law is that the claim shall be held to be as broad as the invention, unless the express and clear language of the specification and claim forbid anything but a narrower construction. Both in the original and the reissue, the inventor expressed his claim by the word "process."

There must be a clear and manifest repugnancy between the reissue and the original in order to justify the destruction of all the inventor's right by declaring his reissue void. All fraud being out of the question, he surrenders his patent in good faith, in order to amend defects as allowed by law. He submits himself, under the law, to the decision of the proper officer, who adjudges that he may properly and lawfully make such an amendment. Only

upon the faith of such a decision does he yield his rights originally secured. If in his judicial view of the situation the Commissioner holds that the law does not permit the change proposed, he stands upon his original patent, and maintains his rights, under it as best he can.

If, however, the tribunal to which the law directs him to appeal decides that his proposed change is just and lawful he surrenders all he has, and takes his new letters—and must stand thereafter upon them.

If he act in good faith it should be difficult indeed in any case to deprive him of everything by reason of the error of judgment made by this tribunal to which he fairly commits the consideration of his rights, under definite statutory provisions.

A fortiori, in the case of a patent of the first order of merit and public utility, against which there is no color of substantial defense other than the technical one of over-expansion. When a man has conferred upon the world a great boon, it is hard indeed to say to him—after years of successful litigation, "You must now lose all reward because the Commissioner of Patents, in the exercise of his discretion as to reissues, under the law, has committed the mistake of accepting a surrender of all you had, and giving you instead something that is worthless."

It is no answer or consolation to say that it was the fault of the inventor in seeking the change. If he acted in good faith he only sought what the proper tribunal might adjudge to be his right. If refused he retained what he had; if acceded he gave up the old in the confidence inspired by judicial decision that the new was better than the old. To lose all would be a punishment due only to fraud or folly too gross for commiseration.

In terms this appeal touches only the soundness of Judge Shipman's decision, but in effect it will also affirm or reverse the decisions of many Circuit Courts and their eminent judges. It will ratify or

disapprove Judge Fisher, Judge Benedict, Judge Dillon, Judge Nelson, Judge Gresham, Judge Wheeler, Judge Nixon, Judge Blatchford and Judge McCrary.

Never has there been such a *consensus* of opinion by so many courts upon a single patent so elaborately and ably litigated.

The very fact of such agreement among judicial minds disposes of the notion that there is a *clear* and *manifest* repugnancy between this reissue and the original. Seven Circuit Courts could not see it, though the most ingenious efforts were made to point it out.

But a repugnancy fatal to the inventor's rights should not be such as can only be arrived at by the skill of microscopic criticism.

This Court, always liberal and just to the true inventor who has benefited his age by his efforts, will not cavil with narrow pedantry over hair-splitting verbal discussions, but exercising a wise and sound criticism, with every proper leaning toward the maintenance of justly acquired rights—will consider the sole question—"Does the reissue secure to the patentee the thing which he invented and described in the original patent?"

Concerning this question it seems to be supposed that a new doctrine has been lately propounded by this Court—unknown to the eight Circuit Courts which have sustained this reissue.

We do not so understand it. The statutory provisions on the subject have not varied much since the first introduction of the system of reissues in 1836.

Long before the law of 1870, under which this reissue took place, this Court announced its views upon the subject in language as emphatic as any employed in the recent cases.

In Burr *v.* Duryee, 1 Wall. 531, Mr. Justice Grier said: "The surrender of valid patents and the granting of reissued patents thereon, with expanded or equivocal claims, when the original was clearly

neither inoperative nor invalid, and whose specification is neither defective nor insufficient, is a great abuse of the privilege granted by the statute and productive of great injury to the public. This privilege was not given to the patentee or his assignee in order that the patent may be rendered more elastic or expansive, and, therefore, more available for the suppression of all other inventions."

This was the law as expounded by this Court in 1863, before the date of Green's original patent.

It was in view of this admonition that all the circuit judges who have passed upon this reissue considered the question. And in the light of this decision all have declared this reissue to be valid.

The recent decisions of this Court on the subject, following each other so closely, and spreading such terror among adroit owners of patents (generally grasping assignees and not original inventors), seeking in bad faith to make their patents "more available for the suppression of other inventions"—have been merely emphatic reiterations of the old doctrine, intended to rebuke and put a stop to such abuses.

They were not designed to promulgate any new law—much less to make a pitfall for the destruction of honest inventors, fairly seeking, through lawful appeal to the discretion of the Commissioner, to secure the just fruits of their skill against invasion by those who are ready to take advantage of the "defects and insufficiencies" incident to the first efforts to put inventions into proper verbal forms.

And a brief reference to those decisions will show that they have no such effect. A rebuke, however, emphatic, to a fraudulent expander of patents under the guise of a reissue, in order to suppress other inventions, need have no terrors for the inventor seeking in good faith under the guidance of the Patent Office the best expression of what he really has invented.

The first of the cases alluded to is Miller *v.* Brass Co., 104 U. S., 352.

The patent was for improvement in lamps. It was issued in 1860, for fourteen years, and extended for seven years longer. The first reissue was in 1873 and the reissue in suit was in 1876—sixteen years after the patent. The original was for a double dome as a means for dispensing with a chimney. The reissue was for a single dome *with* a chimney. The Court said: "It is not only obviously a different thing, but it is the very thing which the patentee professes to avoid and dispense with."

In view of this fact it was most natural and just that when such a reissue, obtained after fifteen years, came before the Court for examination, the principles laid down in Burr *v.* Duryee, should be enforced by yet stronger language, and warning given that in all cases *where a claim is sought to be enlarged* on *such* grounds of mistake as would justify a Court of Equity in correcting it, it must be done promptly, and before other rights had arisen which could be injured by the change.

This was the whole meaning of the Brass Co. case which has excited so much interest among patentees. And in order to allay unreasonable fears, and to confine the case to its true purpose, the Court takes pains to add to its condemnation of the abuse illustrated by the case in hand—which was the fraudulent enlargement of a *claim* under the guise of a reissue—this explanation as to the rights of inventors honestly seeking to correct errors.

"The correction of a patent by means of a reissue where it is invalid or inoperative for want of a full and clear *description of the invention*, cannot be attended with such injurious results as follow from the enlargement of the claim. And hence a reissue may be proper in such cases, though a longer period has elapsed since the issuing of the patent."

During the argument of Wahl *v.* Hine in this Court, concerning the Green patent, counsel for ap-

pellant cited Miller *v.* Brass Co. as conclusive against the patent because there had been three years' delay in making the application.

Mr. Justice Bradley (who had written the opinion) interrupted counsel and said, in substance that the Court had not established a *time* limit; that the Court meant only, as to delay, that the patentee *might* forfeit his right to a patent with broadened claims by *unreasonable delay;* but what would amount to such delay would depend upon the special facts of each case.

The next case was James *v.* Campbell, 104 U. S., 356.

In that case it was held that "It is perfectly obvious that the patentee had embraced in the Reissued Letters Patent several matters of supposed invention different from and additional to the invention which formed the subject of the original patent, and it is principally if not wholly these new and additional claims which the appellant James, as Postmaster of New York, is charged with infringing."

The Court points out some of these obvious additions in a reissue obtained seven years after the original, and shows that it required only an inspection to observe them, and under this state of facts it repeats the doctrine of Burr *v.* Duryee with emphasis, and holds that,

"When a patent fully and clearly without ambiguity or obscurity describes and claims a specific invention, complete in itself, so that it cannot be said to be inoperative or invalid by reason of a defective or insufficient specification, a reissue cannot be had for the purpose of expanding and generalizing the claim so as to make it embrace an invention not described and specified in the original."

This is the whole force and meaning of this decision, and it is plain that it promulgates no new doctrine, but only condemns an obvious abuse, and annuls a reissue unlawfully obtained.

It only declares the plain meaning of the law of reissue—that a patentee shall not use it, or rather abuse it, after long delay, for the sole purpose of claiming something of which he did not apprize the public in his original specification.

Nor did this decision furnish any occasion for anxiety on the part of inventors honestly seeking to secure more fully and firmly against invasion, the inventions they have fairly but imperfectly described.

The next case, still following close upon the others, was Heald *v.* Rice, 104 U. S., 737.

This was similar to the others. It was a like instance of the abuse of the law, palpable on the face of the papers and obvious on a mere inspection.

The Court says: "It appears from the mere reading of the two specifications that the invention described in the first is for the return flue boiler, while that described in the second, abandoning the claim for the boiler itself, is for a particular mode of using it with straw as a fuel, by means of an attachment to the furnace door for that purpose. It might well be that Rice was entitled to patents for both separately, or to one for both inventions. But it is too plain for argument that they are perfectly distinct."

The necessary result followed, and upon the well-settled principles so lately emphasized, the reissue was declared void.

Nor is there anything in this case, any more than the others, to disquiet honest inventors who have sought to secure their real rights by reissue, under the decision of the Commissioner of Patents, invoked in good faith.

The next case was Bantz *v.* Franz, March 20, 1882 (Morrison's Transcript, vol. 4, 341).

The original was issued 1858, and the reissue after fourteen years.

In this case the specifications and drawings in the original and reissue were substantially identical, but in the original the claim was for a combination or arrangement of certain contrivances relating to furnaces for steam boilers, while the reissue was for a

series of six distinct parts of such furnaces separately, or in different combinations.

The Court said: "It is EVIDENT, upon a cursory reading of the specification and claim of the original patent, that it was meant to cover a combination of the several contrivances therein described, and not to cover the several parts of the former as distinct inventions. No claim is made for the several parts of which the former is constructed, but for the arrangements embracing for united use in the manner and for the purposes specified, the following features," etc.

And the Court proceeds to show that no patent could have been obtained for such distinct parts, but only for the combination, and holds that a reissue claiming these parts separately after nearly fourteen years' delay, is void, and that if the original patent was defective or insufficient in claiming the combination instead of the several parts distinctly, it was discernible on inspection immediately, and could have been corrected promptly.

The next case was Matthews *v.* Machine Co., March 27, 1862 (Morrison's Trans., vol. 4, 347).

In this also the reissue attempted to split up the elements of the invention claimed as a combination in the original, and thus to enlarge the scope of the patent, and to obtain by reissue what would have been rejected if originally applied for.

The Court says: "It cannot be denied that each of these separate claims is much broader than the claim in the original patent, and they are put forth in the reissue fourteen years after the original was granted. The latter showed on its face that these broad claims were not made * * * The case clearly comes within the ruling lately made in Miller *v.* Brass Co."

The next case was Johnson *v.* Railroad Co., May 8, 1882 (4 Morrison's Trans., 931).

In this case fifteen years elapsed before the reissue, and the Court found that it required but slight comparison to show that the claim in the reissue of

which infringement was charged was neither described in the specification nor claimed in the claim of the original—that several of the devices essential to the combination described in the original were left out in the reissue, and a separate claim made for the remaining parts, and to these a new and essential function given, which they could not perform under the original patent.

A brief notice will be given of the subsequent reissue cases.

Wing *v.* Anthony, 106 U. S., 142.

Delay—5 years and 5 months. The original claim was for a *mechanism;* the reissue for a *process.* Of course, such a reissue was clearly void and there was no *need* to consider "delay."

Moffat *v.* Rogers, 106 U. S., 423.

Delay—2 years and 2 months.

Held—*Void*, because the reissue covered "a contrivance essentially different" from that described in the original.

This was sufficient to defeat the reissue. The further fact that the reissue was manifestly expanded to cover another *invention* patented after the original, is also given as a ground of defeasance; but that ground does not appear in the case at bar.

Gage *v.* Herring, 107 U. S., 640.

Delay—13 years and 9 months.

Held—That the original claim being for the combination and arrangement of *seven* elements, the reissue with a claim *omitting two* of the elements formerly claimed, was invalid; especially as there was so long a delay that the patent would have expired in 4 months.

Clements *v.* Odorless Co., 109 U. S., 643.

Delay—4 years and 4 months.

Held—That there were material enlargements of the scope of the invention originally described, with

claims *studiously broadened* for the purpose of covering a *subsequent invention* patented to others.

McMurray *v.* Malory, 111 U. S., 97.

Delay—5 years and 8 months.

Held—That the original patent claimed, in only one claim, a particular combination of parts to make a special kind of soldering iron, while in the reissue this claim was expanded into three claims "so as to cover all soldering irons, no matter what their shape or size;" and so as to cover a *subsequent* device.

Turner, etc., Co. *v.* Dover, etc., Co., 111 U. S., 319.

Delay—11 years and 11 months.

Held—That the reissue was void because taken, after nearly 12 years' delay, with broadened claims to prevent the competition of a successful rival.

Mahn *v.* Harwood, 112 U. S., 357.

Delay—3 years and 11 months.

Held—That "It is clear, therefore, on the face of "the patents, that the *only* object of the reissue was "to *enlarge* the claims. The description was not "altered in the least. The claims in the original "patent were *clear and explicit.* * * * "Nothing was altered, nothing was changed, but "to multiply the claims and make them broader." "There was no *ambiguity*, and nothing to prevent "the patentee from seeing at once, on inspecting "his patent, whether his whole invention was "claimed or not."

Coon *v.* Wilson, 113 U. S., 268.

Delay—3 months and 7 days.

Held—That "The description in the reissue is not a more clear and satisfactory statement of what is described in the original patent, but is a description of a *different* thing. * * *".

The patentee waited until defendants produced their different collar—a continuous—band collar,

and then took a reissue to cover the feature of a continuous band, which had been "industriously excluded" from the scope of the original patent.

Wollensak *v.* Rieher, 115 U. S., 96.

Delay—8 years and 9 months.

Held—That where long delay is shown, and it appears that *mere inspection* of the original would have shown that the patent failed to fully cover the area of the invention, and that the reissue, in addition to the 2 original claims, had 7 other claims, that these circumstances constitute laches, which, in equity, disables the patentee from enforcing the right to reissue.

Brown *v.* Davis, 116 U. S., 251.

Delay—11 years and 11 months.

Held—That there was *new matter* introduced into the specification for the purpose of reaching machines which the claim of the original patent would not reach; that this fact, in connection with over 11 years' delay, should defeat the reissue.

Yale Lock Co. *v.* Sargeant, 117 U. S., 537.

Delay—5 years and 1 month.

Held—"There can be no doubt that claim 4 of "the reissued patent was invalid as an *unlawful* "*expansion* of the original patent, on an application for the reissue, filed more than 5 years after "the original patent was granted."

Gardner *v.* Herz, 118 U. S., 180.

Delay—7 years and 5 months.

Held—The second claim only one involved. This claim is void *because it is all old.*

Eachus *v.* Broomhall. U. S., late case.

Delay—2 years.

Held—Void, because the original patent was for a *machine*, while the reissue was for a *process*.

Powder Co. *v.* Powder Works, 98 U. S., followed.

White *v.* Dunbar. U. S., late case.

Delay—Nearly 5 years.

Held—That there was delay of nearly 5 years; that the original patent did not warrant the enlarged claim; that the reissued patent contained a claim materially enlarged and expanded, and that it was apparent that the reissue was obtained to cover defendant's patent, granted nearly 4 years after the original patent, and that, under these circumstances, the reissue was void.

We have thus referred at length to all the recent reissue cases which have come under our notice.

None of them, it is submitted, discloses a case parallel with, or damaging to, the case now before the Court.

The substance of the matter is:

1. A claim may be enlarged by reissue, if it is done properly, and the necessity for it has been caused by such inadvertence or mistake as would afford ground for relief by a court of equity.

2. Defects or insufficiencies in the specification which render the patent either "inoperative" or "invalid" for want of a full and clear description of the invention, may be cured, by reissue, even after the lapse of an indefinite time.

3. In order to work the hardship of actual loss of all that was secured to the inventor, his attempt to cover more than he originally claimed, *must be so long delayed to the injury of others, and so palpably shown as to subject it to the imputation of fraud.*

Upon these principles it is confidently submitted that the reissue in this case is manifestly valid.

The following are the original patents granted January 14, 1868, and the reissue dated May 9, 1871, in parallel columns:

[4372.]

UNITED STATES PATENT OFFICE.

NELSON W. GREEN, of Amherst, Massachusetts, Improvement in the Methods of Constructing Artesian Wells.

Specification forming part of Letters Patent No. 73,425, dated January 14, 1868; Reissue No. 4,372, dated May 9, 1871.

To all whom it may concern:

Be it known that I, Nelson W. Green, of Amherst, in the County of Hampshire and State of Massachusetts, have invented a new and Improved Method of Constructing Artesian Wells; and I do hereby declare that the following is a full, clear and exact description of the same, reference being had to the accompanying drawing forming part of this specification.

My invention is particularly intended for the construction of artesian wells in places where no rock is to be penetrated.

The methods of constructing wells previous to this invention were what have been known as "sinking" and "boring," in both of which the hole or opening constituting the well was produced by taking away a portion of the earth or rock through which it was made.

NELSON W. GREEN, of Cortland, N. Y.

LETTERS PATENT, No. 73,425.—Dated Jan. 14, 1868.

Improved Method of Constructing Artesian Wells.

To all whom it may concern:

Be it known that I, Nelson W. Green, of Cortland, in the County of Cortland, and State of New York, have invented a new and useful improvement in the manner of sinking and constructing Artesian or Driven Wells, where no rock is to be penetrated, and of raising water therefrom; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings making a part of this specification, in which—

Figure 1 represents a portion of the rod, which is driven or forced into the ground to form the opening or hole for the insertion of the tube that forms the casing or lining of the well, and the avenue through which the water is raised to or above the surface of the ground. And

Figure 2 represents a portion of the tube.

This invention consists in producing the well, by driving or forcing down an instrument into the ground, until it reaches the water, the hole or opening being thus made by a mere displacement of the earth, which is packed around the instrument, and not removed upward from the pole as it is boring. The instrument to be employed in producing such a well, which, to distinguish it from "sunk" or "bored" wells, may be termed a "driven well," may be any that is capable of sustaining the blows or pressure necessary to drive it into the earth; but I prefer to employ a pointed rod, which, after having been driven or forced down until it reaches the water, I withdraw, and replace by a tube made air-tight throughout its length, except at or near its lower end, where I make openings or perforations for the admission of water, and through and from which the water may be drawn by any well known or suitable form of pump.

In certain soils the use of a rod preparatory to the insertion of a tube is unnecessary, as the tube itself, through which the water is to be drawn, may be the instrument which produces the well by the act of driving it into the ground to the requisite depth.

To enable others to make and use my invention, I will proceed to describe it with reference to the drawing, in which—

Figure 1 represents a portion of the pointed rod above mentioned, and Figure 2 a portion of the tube which forms the casing or lining of the well.

The driving rod, A, I construct of wood or iron or other metal, or

My invention consists in driving or forcing an iron, or a wooden rod with a steel or iron point, into the earth, until it is projected to or into the water, and then withdrawing the said rod and inserting in its place a tube of metal or wood to the same depth, through which and from which the water may be drawn by any of the usual well known forms of pumps.

To enable others skilled in the art to make and use my invention, I will proceed to describe the same with reference to the drawings.

The driving rod A, I construct of wood, or iron, or other metal, or of parts of each, with a sharp point *b* of steel or otherwise, to penetrate the earth; and a slight swell *a* a short distance above the point, to make the hole slightly larger than the general diameter of the rod. This rod I drive by a falling weight, or other power, into the earth, until its point passes sufficiently far into the water to procure the desired supply. I then withdraw the rod, and insert in its place the iron or wooden tube B, which may be slightly contracted at its lower end to insure its easy passage to its place. In general, this tube B, I make of iron, and of a thickness that will bear a force, applied to its upper extremity, sufficient to drive or force it to its place; and where a large or continuous flow of water is desired I perforate this lower end of the tube to admit the water more freely to the inside. The perforations *c* may be about one half of an inch in diameter, less or more, and from one to one and a half inches apart; and the perforations

of parts of each, with a sharp point, *b*, of steel, or otherwise, to penetrate the earth, and a slight swell, *a*, a short distance above the point, to make the hole slightly larger than the diameter of the rod. This rod I drive, by a falling weight or other power, into the earth, until its point passes sufficiently far into the water to procure the desired supply. I then withdraw the rod and insert in its place the air tight iron or wooden tube, B, which may be slightly contracted at its lower end to insure its easy passage to its place. In general, this tube, B, I make of iron, and of a thickness that will bear a force applied to its upper extremity sufficient to drive or force it to its place; and where a large or continuous flow of water is desired, I perforate this tube near its lower end to admit the water more freely to the inside.

The perforations, *c*, may be about one-half an inch in diameter, less or more, and from one to one and a half inches apart, and the perforations may extend from the bottom of the tube upward from one to two feet.

The diameter of the tube should be somewhat smaller than the diameter of the swell, *a*, on the drill end of the driving rod, A.

In localities where the water is near the surface of the ground, and the well is for temporary use only, as in the case of a moving army, or for temporary camps, lighter and thinner materials than iron may be used for making the tubes, as, for instance, zinc, tin, copper, or sheet metal of other kind, or even wood may be used.

may extend from the bottom of the tube upward from one to two feet. The diameter of the tube should be somewhat smaller than the diameter of the swell *a* on the drill end of the driving rod A.

In localities where the water is near the surface of the ground, and the well is for temporary use only, as in the case of a moving army, or for temporary camps, lighter or thinner material than iron may be used for making the tubes, as, for instance, zinc, tin, copper, or sheet metal of other kind, or even wood may be used. The rod may be of any suitable and practical size that can be readily driven or forced into the ground, and may be from one to three inches in diameter.

Any suitable well known pump may be applied to raise the water up through the tube to the surface or above it.

Having thus fully described my invention, what I claim and desire to secure by Letters Patent is the herein described process of sinking wells where no rock is to be penetrated, viz., by driving or forcing down a rod to and into the water underground, and withdrawing it, and inserting a tube in its place to draw the water through, substantially as herein described.

N. W. GREEN.

Witnesses :

A. B. STOUGHTON,
JOS. PECK.

The rod may be of any suitable and practical size that can be readily driven or forced into the ground, and may be from one to three inches in diameter.

In some cases the water will flow out from the top of the tube without the aid of a pump. In other cases the aid of a pump to draw the water from the well may be necessary. In the latter cases I attach to the tube, by an air-tight connection, any known form of pump.

What I claim as my invention, and desire to secure by Letters Patent, is—

The process of constructing wells by driving or forcing an instrument into the ground until it is projected into the water, without removing the earth upwards as it is in boring, substantially as herein described.

N. W. GREEN.

Witnesses:

SYDNEY E. SMITH,
W. MORRIS SMITH.

1. The time which elapsed was about three years and four months.

2. So far from presenting a case where upon inspection the claim is manifestly enlarged or varied from the original, it is an instance where the difference between the two claims seems so trifling as scarcely to account for the trouble of the reissue. And the drawings are precisely identical.

Both are claims for a *process*.

Both are for a process of sinking wells.

Both are for this process by means of driving or forcing—in the one a *rod*, and in the other an *instrument*—into the water and ground, as described in the specifications.

The differences are only that in the original the words "where no rock is to be penetrated" used in

the specifications are repeated in the claim, while in the reissue these words, being used in the description are omitted in the claim.

And that in the original the words "and withdrawing it (the rod) and inserting a tube in its place to draw the water through," are omitted in the claim of the reissue while the words "without removing the earth upwards, as it is in boring," are employed in their stead.

These are absolutely all the differences between the claims, and it needs no argument to show that this is not a case where an inventor who has conferred a boon upon mankind must be deprived of all the rights secured to him, because he has, after long laches, sought to gain by reissue what he was never entitled to.

In fact the only real difference is the omission of the words "where no rock is to be penetrated."

The invention as conceived and described by the inventor evidently would be applied generally to soils adapted to the process. Therefore he claimed the use of the process in such localities. But it soon became obvious that such soils might exist beneath a layer of rock which could readily be removed or penetrated in order to reach them and apply the process.

It might be desired to drive a well beneath a flagstone. It is obvious that the inventor did not intentionally exclude such uses of his process, and that so to construe his claim would be a perversion of his meaning.

The use of those words in the *claim* might lead to such perversion, and therefore to avoid this effect of his inadvertence, and within a reasonable time, he simply left the words out of the claim, and said on the outset of his description that his invention was "*particularly* intended for places where no rock is to be penetrated."

It seems trifling to argue that the difference between a *rod* and an *instrument* is such as to invalidate the reissue, or that the change in the mode

of expression "and withdrawing it and inserting a tube in its place to draw the water through," "without removing the earth upward, as it is in boring," was made with a view to enlarge the scope of the patent, or to claim what was not invented.

A reference to both specifications will make it manifest that this was in no sense a substantial change. So slight was it indeed that its purpose is scarcely evident.

At all events, the invention is the same originally made and claimed, and the change in the claim for whatever purpose made, and whether necessary or not, was made in good faith and without unreasonable delay.

3. But the true reason for the reissue was not to change the claim, but to amend supposed defects and insufficiencies in the specifications.

This may be done—even after a long time—not only when they make the patent invalid, but when they cause it to be "inoperative" in a greater or less degree.

That is to say, if a defective or insufficient description tends to circumscribe the fair operation of the invention, the inventor may amend it by reissue whenever he finds it out.

And this for the reason given by the Court in Miller *v.* Brass Co., that such amendment "cannot be attended with such injurious results as follow from the enlargement of the *claim.*"

Now, in this view it seems unnecessary to dwell at length on the comparatively slight and unimportant changes in the specification. They are in effect the same, as the drawings to which they refer are identical.

Indeed, it requires a critical examination to discover the nature and meaning of the amendment in the specification and description which was the occasion of the reissue.

In both, the inventor says that his invention relates to an improved method of constructing wells.

In the original he says it is an improvement "in the manner of sinking and constructing Artesian or Driven Wells where no rock is to be penetrated, and of raising water therefrom."

In the reissue he says it is "particularly intended for the construction of artesian wells in places where no rock is to be penetrated," and he goes on to make a remark in explanation not made in the original—"the methods of constructing wells previous to this invention were what have been known as 'sinking' and 'boring,' in both of which the hole or opening constituting the wells was procured by taking away a portion of the earth or rock through which it was made."

Thus far the changes are certainly verbal, and immaterial and are manifestly only for the purpose of explaining more clearly the nature of the invention.

Driven Wells are now so common and familiar that we can hardly appreciate the difficulty then experienced in putting their nature and use in intelligible words.

The original, then, goes on to say in few words how the invention is to be put in practical use. The words are: "My invention consists in driving or forcing an iron or wooden rod with a steel or iron point into the earth until it is projected to and into the water, and then withdrawing the said rod and inserting in its place a tube of metal or wood to the same depth, through which and from which the water may be drawn by any of the well-known forms of pumps."

He then goes on to describe the invention with reference to the drawings in order to enable others to use it.

Now with this specification before him, Judge Fisher, on an appeal from the decision of the Commissioner of Patents, in his decision made a few days before the patent was issued, said:

"I am clearly of opinion that Green first put into practice the conception of making a Driven Well,

and is entitled, therefore, to his patent for the broad claim of sinking wells *by driving down the pump or rod, without removing the earth upward*, and that Suggett was entitled to a patent for the perforated pipe and point for sinking wells, and I therefore affirm the decision of the Commissioner." (Record, page 75.)

Now this decision was on the original specification and claim before the patent was issued.

The specification said nothing of driving down the "*pump*" or of the fact that the process dispensed with removing the earth upwards. But Judge Fisher found its meaning plain enough, and took it for granted from the description that wherever a mechanic was making a well in a soil that would permit it, he would find it *superfluous* to drive the rod first and then substitute the well-tube, and would, of course, drive down or push down the tube itself, as we have done in the box of sand in *our* experiments in court described. *Ante*, p. 13. Just as the carpenter who wants to drive a screw will not bore a hole first if the wood is soft enough for the screwdriver to send the screw home.

Since Judge Fisher found no defect in this particular, sufficient to obscure his view of the real invention as Col. Green conceived it and put it in practice; it was not anticipated that any defective or insufficient description in this respect would make the patent in any degree "inoperative," and it ought not to have done so.

If persons desiring to use this valuable invention had been as wise and as fair as Judge Fisher, there would have been no difficulty, and the patent would not have proved at all "inoperative," by reason of the defect of omitting to suggest this obvious equivalent—the driving of the pump in the first place if the soil was found suitable.

But, as the invention became known and valuable, counsel for the patentee began to scrutinize the patent, and determine whether or not it was in any way defective or not fully operative.

The patent had been drawn, not by counsel but by a "patent solicitor."

Upon such examination, first made about three years after the original grant, counsel found that if a narrow and literal construction were given to the "claim," some might think the process was limited to the driving of an actual *rod* before driving the pump tube; and that if the use of the rod were omitted, and its equivalent the pump tube were driven instead, that the patent would not be infringed.

Accordingly, and to make clear that the use of this manifest mechanical equivalent in carrying out the process, was included in the invention, the reissue was applied for.

There is nothing in this case to show that any one ever actually acted upon the narrow construction above suggested. But, it was supposed that such action might be taken, and in anticipation thereof the patent was surrendered and reissued with an amended specification and claim.

If any one had have made wells while the original patent was in force, without the use of the rod, he would have urged that the *rod* was named in the claim, and that a well made without an actual *rod* would not be an infringement. This would have been unfair and unjust to the inventor. Under such a construction the patent would have been largely inoperative.

Now this was precisely the hardship that the reissue statute was intended to prevent, and it was what this Court, in Miller *v.* Brass Co., said might be done without injury to the public, and without reference to time.

To remedy this anticipated hardship, the inventor applied to the Commissioner to amend this defect in description by putting in it, in express terms, justwhat Judge Fisher declared him entitled to.

The Commissioner determined it to be right, and so the description was amended thus in the reissue:

"The instrument to be employed in producing such a well, which to distinguish it from sunk or bored wells, may be termed a Driven Well, may be any that is capable of sustaining the blows or pressure necessary to drive it into the earth, but I prefer to employ a pointed rod, which after having been driven or forced down until it reaches the water, I withdraw and replace by a tube, made air tight throughout its length, except at or near its lower end, where I make openings or perforations for the admission of water, and through and from which the water may be drawn by any well known or suitable form of pump.

"In certain soils the use of a rod preparatory to the insertion of a tube is unnecessary, as the tube itself through which the water is to be drawn may be the instrument which produces the well, by the act of driving it into the ground to the requisite depth."

This last suggestion—which did not need stating to a mind like Judge Fisher's, but was necessary to make the patent fully operative against obtuse or disingenuous infringers, was the real defect or insufficiency in description which occasioned and justified the reissue.

It was a just exercise of the right conferred by the law, and it would be a monstrous perversion of the law to hold that by using such a right the inventor lost all that he had secured by so much cost and skill.

After this change, the description with reference to the drawing goes on in almost the identical words of the original.

The only noticeable variation is the allusion to the fact that in some cases the water will flow from the well without the aid of a pump, and that when a pump is used it is to be attached to the tube "by an air-tight connection."

It was surely a mere superfluity to say that when you attach a pump to a tube from one to three inches in diameter with perforations only at the

lower end, for the purpose of drawing water through it, the connection with the tube should be air-tight; it is only like saying that a hose or a syphon should not be full of holes, but air-tight in order to perform its functions.

The original patent had stated that the pump must be *applied to* the tube. This is saying that it must be applied properly for the purpose intended—that is, with an air-tight connection, just as a hose must be applied to a fire engine before it can answer its purpose.

But it is urged that Green having disclaimed in his original patent what was secured to Suggett, and having omitted this disclaimer in the reissue, must be held to have embraced in the reissue what he had already disclaimed, and that, therefore, the reissue is void.

The answer is that he did not embrace anything he had disclaimed. What Green and Suggett invented were totally different things.

One was a process of procuring water from the earth, and the other was for certain mechanism, which was as applicable to open wells as to driven wells, and had no relation to the principle upon which Green's invention was founded.

Therefore, when he came to procure his reissue, which was only for the original process, it was entirely unnecessary for him to refer to his former disclaimer, and his reissue did not attempt to embrace anything which had already been embraced in Suggett's patent, and the disclaimer in the original was a mere superfluity—it needed no reference in the reissue, and was therefore omitted.

It may be observed that the Suggett patent was afterwards held void in Hazelden *v.* Ogden, 3 Fisher, 378.

The case of Leggett *v.* Avery, on the subject of disclaimer, has no bearing on this case.

There the patentee, holding a patent embracing six claims, applied for an extension at the expiration of his patent. He was opposed by those interested,

and the acting Commissioner of Patents refused to grant the extension, unless he would abandon all claims except the fifth. Thereupon he disclaimed accordingly, and the patent was extended for the fifth claim only, which the defendants had not infringed. His disclaimer was filed on the 5th of October, 1874, and his extension granted on the ninth of the same month. On the same day he applied for another reissue, which included substantially the rejected claims, the claims which had been rejected and disclaimed. The Examiner refused to pass the application, but through persistence the reissue was finally granted. The Court held, of course, that this reissue was invalidated; he was plainly estopped from embracing in his reissue claims which had been formally rejected, and which he had distinctly disclaimed, and it might almost be regarded as a matter of contract, and his reissue a palpable violation.

It was absurd to pretend, in that case, that his reissue was intended to correct an error which had arisen by inadvertence, accident or mistake. As Mr. Justice Bradley says, in the opinion of the Court, "Such a pretense was too bald for consideration." And certainly this case does not mark any tendency on the part of the Court to depart from principles already established concerning reissues, but simply holds that a patentee shall not be sustained in committing a manifest fraud. Nor is there anything in the cases, Manufacturing Co. *v.* Corbin, 103 U. S., 786, nor in the case of Manufacturing Co. *v.* Ladd, 102 U. S., 408, to sustain the effort in this case to disturb the numerous decisions already made upon this subject. In the latter case Mr. Justice Bradley denounces the abuses which are so apt to arise out of reissues, and shows that the real object and design of reissues have been frequently subverted; but he says nothing which supports the position that where a patentee of a process goes out of his way to disclaim what is embraced in a patent for a machine relating to the

same subject, being a mere mode of operating the process, which patent itself turns out to be void, must submit to having his reissue invalidated because he did not repeat the superfluity. The principle established is, that where a patentee makes a claim which is disallowed by the Patent Office, and thereupon disclaims what is so disallowed, as a condition precedent to the grant, he cannot afterwards, by a reissue, again smuggle in that claim, and expect to maintain his patent.

To say that, is only to say that he will not be permitted to perpetrate a fraud. But in this case no such attempt is alleged, but in procuring the reissue he simply omits what was defective in his original patent, and applies in the strictest way the principles upon which reissues depend. He simply omits to say that he does not claim the Suggett patent, which was never embraced in his original patent, or attempted to be covered by his reissue, and which had been declared void between the time of granting the original patent and applying for the reissue (see Hazelden *v.* Ogden, 3 Fisher, 378).

We have thus noticed at unnecessary length all of the changes made in the Reissued Letters Patent which are the subject of this controversy.

We respectfully submit that the closest scrutiny made in the light of the recent decisions of this Court shows this to be a case in marked contrast with those which revealed the abuses of the statute authorizing reissues, lately condemned so strongly by the Court, and proves that it is one in which the very objects of the statute have been sought in good faith by the patentee and lawfully allowed by the Commissioner.

If any stress is laid on the suggestion of laches on the part of the patentee in seeking the remedy provided by the statute, we reply that the need for the remedy was only developed by time.

When the need of amendment arose, it was sought for and applied.

The statute says: "*Whenever* any patent is inoperative," etc. This expression has no limit but the

term of the patent. The meaning is that whenever a patent *becomes* or is *found to be* inoperative, an amendment may be made.

It is true that there might be a case where by affirmative proof it appeared that other parties had been misled by the supposed defect to make heavy investments, and were thus injured by the delay in correcting it. But here there is no such proof, and no presumption of the kind is suggested, nor is there any fact on which to found one.

SUMMARY.

PRIOR to Miller *v.* Brass Co. (1881), no case had held that *delay* in applying for a reissue might be a bar to its lawful grant.

It is submitted that this doctrine, to which (as we understand it) we accede, rests upon the law of *equitable estoppel by conduct.*

That when a patentee *unreasonably* delays to apply for a reissue, an *equitable estoppel* is raised to prevent his applying for a reissue with claims broader than those in his original patent. And that if he do so apply, the reissue cannot lawfully be granted. And that if granted, the Courts may declare it invalid.

To this we agree.

But, we submit, that such an *estoppel by conduct* is in the nature of estoppel *in pais*, and must be affirmatively shown to be raised *clearly* and *certainly*, and the party claiming the estoppel *must show that he acted* upon the statements or conduct of the party whom he seeks to estop.

Bigelow on Estoppel (p. 437), states the essential elements upon which estoppel by conduct must be founded. Among them is, *in substance*, this:

The party who seeks to raise the estoppel must show that he was *induced* to *act* as he did by the *representations* of the other party.

Of course, in the case at bar, the "representations" are those contained in the *original* patent. But his *action* (as proofs show) was not taken until

after the reissue, and after (by presumption of law) he knew that the reissue was in force, and was *prima facie* valid. It therefore does not lie in his mouth to say that he acted upon the *representations* of the *original* patent; *for at the time of his action* that patent was *canceled*, and only the reissue was in force. His action was at his own risk, and with knowledge of the representations of the reissue, and those latter representations corrected the former.

Equitable estoppel can arise *only* between *privies;* in this case, between the *parties* themselves.

The government cannot raise the question. Nor can the Courts, as a branch of the government.

In an equity court the party claiming estoppel (as appellant here), ought to plead it in his, answer, by apt averment, so that the other party might have proper and fair opportunity to plead, answer, or demur, and to fortify himself by proofs. True, it has been held that the Court might, as a technical right, consider this defense without an averment in the answer, in a case of *gross* delay, but fair play and liberality suggest most strongly the propriety of averring *laches* by answer. There is no such pleading here. The appellees have had no opportunity to put in any proofs to explain or account for delay. *Non constat*, the patentee, might have been able (for aught the Court knows) to show that during the delay he was *insane*, *under duress*, ill, or absent from the country, or to give other sufficient excuse.

He has had no opportunity to explain, excuse or account for the delay. And for a most sufficient reason. This kind of defense was never sustained or suggested until 1881 (Miller *v.* Brass Co.), long *after* his bill, filed June, 1879, and after the answer, filed August, 1879. Ought he to be required to possess prophetic power and to anticipate the new doctrine? To adjudge him, in this case, guilty of *laches*, and to raise an equitable estoppel against him, and to deprive him of *all rights* under his

patent, because of *delay*, when delay was universal and *universally sanctioned by the courts*, when there was no decision or practice requiring special diligence, seems to be harsh and inequitable to one who has given mankind an invention of the highest value.

In this case the delay was a little over three years; there was no harm to any one; no averment or proof that any one had, in reliance upon a narrow construction of the original patent made a single well or invested a single dollar; no averment or proof that any subsequent invention was "scooped in" by an "expanded" claim. Nothing, whatever, either by averment or proof, to show that the reissue was intended or adapted to take from the public any right it had ever exercised.

In a word—the reissue did but two things, both of which were and are lawful:

1. It *bettered* the *description*.

2. It modified the claim so as to include the manifest *mechanical equivalent used* in the *process* claimed. And this mainly for greater caution, and to warn the obtuse against the substitution in the "process" of one obvious mechanical equivalent—the *pump tube*—for another—the *rod*.

The *statute*, it is certain, imposes no time-limit upon the right to apply for a reissue.

Neither has this Court laid down any rigid and specific time-limit. The ruling in Wollenksak *v.* Rieher comes nearest to doing so. It held that over two years' delay, where the object was *solely* expanded claims, would be fatal—where *mere inspection* of the original patent would necessarily have shown that the claims did not *cover the area* of the invention.

But even this opinion does not say broadly and rigidly, that in no case can a reissue be granted with expanded claims after more than two years' delay.

Mere lapse of time, without other circumstances, is not conclusive upon the existence or want of inadvertence, or of intention to dedicate the invention to the public. Other facts and circumstances must appear, which, in connection with a long delay to assert a right, will *exclude* any other conclusion than the absence of inadvertence, accident, or mistake.

Where, however, all that the record shows is that a patentee was *justly entitled* to a larger or more explicit, or more comprehensive statement of claim of invention, and that he has simply delayed his application for two or three years, it is unreasonable to hold that he has forfeited his right.

One of the soundest counsellors of this court has well said:

"Where an original patent, in view of the state "of the art, shows on its face that the inven- "tion described in it could well support a larger "claim of invention, it ought to be said that *notice* "*is thereby given* to all the world that the larger "claim may be secured by a reissue *whenever* the "inventor discovers the insufficiency of the tech- "nical legal instrument called a 'specification of "'claim,' which he holds. Concede, as we must, "in recognition of the law of the recent cases de- "cided by the Supreme Court, that a patentee must "proceed promptly to secure his right, after re- "ceiving notice of the defect in his patent, lest he "work an estoppel upon himself by his laches "in action, the question at once arises, when he "in fact had, or is to be presumed to have had, "such notice? Is the claim '*ambiguous?* Might "he well have *supposed* that he already embraced "such larger subject? Or, is it *apparent*, as in "Miller *v.* Brass Co., where the original invention, as "stated, required the exclusion of a lamp chimney "from the combination, that the reissue undertook "to introduce the very matter originally excluded?"

"The *period of delay* in making the application "for enlargement of claim is, in truth, *the least*

"*cogent*, considered alone and by itself, of all of the "circumstances which, from an examination of the "patent and the record of testimony, must be taken "into the account, before 'an intention to dedi- "cate' can be *presumed* or a forfeiture of a right "be legally established, on the sound principles of "law."

There are now in being about 200,000 patents, granted prior to Miller *v.* Brass Co.; all of these were granted under the law (and so interpreted by the Courts), which permitted a reissue without regard to the time of application. In all of these, up to Miller *v.* Brass Co., the patentees held a *vested right* to reissue and claim all that had been shown in the original. It is hard to comprehend how a rule of law, or interpretation, first made in 1881, can *retroact*, so as to destroy rights previously vested in patents granted and *accepted* upon the faith of the preceding law and interpretation.

We do not deem it proper to discuss this question save only to suggest it as an overwhelming reason, why, in enforcing the new interpretation, the Court should apply it with the tenderest consideration and the largest liberality.

Then, too, these facts—the very great utility of the invention in controversy, and its use by millions all over the country in individual wells; and its extraordinary value as a new means of supplying *cities* with water (as in Brooklyn, N. Y., where 20,000,000 gallons, have long been supplied daily) call upon the Court with an earnest voice, to be cautious about applying a harsh, technical rule, so as to defeat the claims of a great public benefactor.

New York, Dec., 1886.

J. C. CLAYTON,
of Counsel with Appellees.